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SOME INTERESTING CENTRAL-STATION STATISTICS.

A paper in a recent foreign contemporary, noted in the Digest this week, takes up some rather unusual features of station statistics based on German and Austrian practice. This practice is not at all rigorously comparable with that in our own country, yet the same kind of facts would quite certainly be brought out by a similar investigation here. The American stations unquestionably show a better utilization of the market on the whole than in most foreign cities, owing frequently to a less keen competition from gas, although in some cities, notably Berlin, there has been very rapid increase in output, particularly with respect to motors. One of the striking features brought out in the paper under discussion is the great difference between German and Austrian practice so far as motor load is concerned. Germany is notably a manufacturing country and shows a much greater utilization of electric motive power than is to be found in neighboring Austria. Another interesting line of investigation is that concerning the relations between station capacity and connected load, where the difference between small stations, large stations and medium-sized stations is very marked. Even more marked and more striking is the study made of investment with respect to capacity. There is in this particular a marked difference between Austria and Germany, the Austrian stations showing throughout the lower figures, but in both countries the medium-sized stations, say, from 3000 kw to 6000 kw, show the lowest capital figures, the small stations and the large ones rising very conspicuously. The small station situation is probably due to lighter general load and difference in cost of machinery, while the larger stations, of course, show marked effect from the greater cost of the underground distribution in cities of considerable size.

It would be interesting to gather the same data for American cities, where a minimum point would doubtless be very much in evidence, but would quite certainly lie at a larger output on account of the small amount of underground work done in this country and the larger output per capita. We fancy the conclusion of the German author that there is no definite relation between the size of the city and the output per capita for lighting purposes would be even more strongly brought out by American statistics. Generalizations on this subject are very hazardous, as statistics which we have recently published show. The output salable in any given community in lighting is a most uncertain matter, and the motor load is even more uncertain, but seems here, as it does abroad, to be relatively greater in the larger cities, owing, of course, to the relatively large amount of small manufacturing that gathers in large cities, and to other contributing factors. The matter of investment with respect to the size of stations deserves analysis, although, of course, the basis on which investment is to be reckoned is in the case of many American stations at least somewhat uncertain. The general situation is that with proper installation the largest cities which have not undertaken any considerable amount of underground dis-

tribution should show the lowest investment per kilowatt both of capacity and of output. It is a matter of common experience that such cities frequently also show low prices, perhaps for this very reason, and large output per capita.

There is an element of great uncertainty introduced in the question of cost by the fact that station investments do not grow steadily with respect to output, but vary suddenly as new undertakings in the way of distribution come up. For instance, a city station may occupy thoroughly a considerable territory at a not excessive cost of distribution, but to occupy the rest of the urban territory with equal thoroughness may mean a very large addition to the investment with somewhat inadequate returns for the first few years. Almost every American station, too, shows a succession of physical reorganizations forced upon it by growth and changes in the art which tend to increase the investment out of all proportion to the ordinary requirements of the growth of the business. Nevertheless, a suitable analysis of the figures as they stand afford some very valuable information regarding the actual business situation in various plants. If, for example, one finds data from a certain plant showing an altogether abnormal relation between output per capita, total output and cost, it is clearly time to overhaul the operating and bookkeeping departments in order to locate the discrepancy. The facts cannot be expressed by a smooth curve, but they are at least sufficiently correlated to enable one to locate the unusual and the dubious. It would be of benefit if someone with a taste for statistics would do for a large group of representative American stations just what Mr. Rosenbaum has done in relation to stations in Germany and Austria. The data already at hand here are interesting, but do not cover large enough groups of plants to bring them to their full value.

REGULATIONS FOR TESTING RUBBER INSULATION.

The great advantages which the resins caoutchouc and guttapercha possess for insulating wires are their flexibility and imperviousness to liquids. No other materials possess these qualities jointly in so high a degree. On the other hand, the large demand for rubber in other than electrical industries tends to keep the price of the material relatively high; and while we have two arctic and two temperate zones, we have only one tropical zone, which possesses a monopoly of the rubber tree—a seeming case of a prehistoric trust. The temptation that displays itself to the insulation manufacturer in the shadow of competition to reduce to a minimum the amount of rubber in his insulating material, is strengthened by the technical difficulty in the chemical analysis of rubber mixtures; so that adulteration often defies detection when rubber is replaced to a considerable extent by a well-selected "filler," a term which often covers a multitude of sins. Nevertheless, the durability and imperviousness of the insulation depend markedly upon the amount of rubber present in the mixture, up to a certain point. Reference is made in the Digest to an announcement which has recently appeared in the *Electrotechnische Zeitschrift* of a a co-operative agreement, in Germany, between manufacturers of insulated wires and the Königlich Materialprüfungsamt, according to the manner and means of chemically testing rubber insulation. Recognition is expressed of the fact that such a plan and system of testing redounds to the benefit of German trade products in the markets of the world.

The composition of standard rubber insulation is stated to be 33⅓ per cent of caoutchouc, containing not more than 4 per cent of resin and 66⅔ per cent of added material, including sulphur. The specific gravity of the material is to be at least 1.5. The tests prescribed cover specific gravity and four chemical analyses, one of which is admittedly only qualitative. The method prescribed for carrying out the specific gravity test is that the material tested must sink in an aqueous zinc chloride solution of specific gravity 1.49 at 15 deg. C. A standard solution of this character can be made up in considerable quantities ahead, so that this test can be made expeditiously. The advantage of the chemical tests specified is that the technique of each is carefully detailed. The reliability of the results in such tests is distinctly influenced by the character of the technique employed, even in the hands of trained chemists. Consequently, the publication of the technique is almost as important as the statement of the test itself.

The benefits derivable from the agreement and testing system are likely to be manifold. Not only is supervision maintained over factory production, and standardization secured in the manufacture, but the uncertainties of adulterative competition are reduced to a minimum, thus encouraging manufacture and the reduction of margins of security in cost price. Moreover, confidence in the quality of the output is increased in the minds both of the manufacturer and of the consumer, abroad and at home. It would be well if a similar plan could be worked out in this country. We already have an insulation-testing bureau which works in the desired direction; but we need, in addition, a bureau of chemical analysis, which should act as a check upon the quality of all rubber-covered wire, since the influence of poor quality may not be manifest until after long use.

INTERNATIONAL ELECTROTECHNICAL NOTATION.

Our Digest of foreign literature contains this week a reference to views recently expressed in the *Elektrotechnische Zeitschrift* upon the subject of international notation for electrical engineering literature. We published in an article contributed by Dr. Kennelly, last year, a table of the symbols used in well-known electrical engineering text-books published in England, France, Germany, Italy and the United States. The table appears to indicate that some half-dozen electric and magnetic quantities are already represented internationally by specific algebraic symbols, so that, without making any compromise or change, a good opening exists for the work of the International Electrotechnical Commission in international standardization of notation along this path of minimum resistance. Our German friends do not seem to question the apparent agreement already existing internationally among electrical engineering writers on these particular symbols. They indicate, however, a stronger sense of allegiance to other branches of engineering in Germany than to the cause of international electrical engineering by itself. Any advance made toward standardizing notation, in Germany, seems then to be more likely to occur, for the present, in the direction of national standardization, over the whole domain of applied science, rather than toward international electrical engineering.

There is much to be said on both sides of this question, and we hope to see it thoroughly discussed in the technical press of various countries. There are, it seems to us, two sets of ideas

involved in the question which are quite distinct, although they do not necessarily clash. The first is the question of electrical engineering versus applied science generally. The second is the question of national standard notation versus international standard notation. As regards the first question, we agree with our German friends that it would unquestionably be most desirable to have the notation of all applied scientific literature standarized. The task is, however, rendered vastly more difficult as we increase the number of branches of engineering and of engineering societies involved in the discussion. After all, the question is not one of fact, but of expedience. It is more expedient that all text-books in the same class should use standard notation than that text-books in different classes should use a larger common standard notation, for the reason that there are more men who use either electrical text-books in common, or mechanical text-books in common, than who use both electrical and mechanical text-books in common. Moreover, in seeking to co-ordinate all branches of applied science, we run the risk of losing all our efforts in the complexity of the task; whereas, if each engineering branch can standardize its own notation first, which is a relatively simple task, then mutual adjustments can subsequently be made between the various engineering societies to harmonize their individual systems.

As regards the second question, while we agree that national standardization is very important, yet we think all will agree that international standardization is far more important. With the constant interchange of ideas, and of scientific literature between all the various countries, it would be impossible to maintain national standard literature without the aid of the police courts and penitentiaries if the various national literatures diverge, for the reason that the reader tends unconsciously to copy the writer. This is shown by the degree of agreement that already exists without any official effort between the electrical symbology of the various nations. They tend to unify themselves by imitation. Consequently, no national system of technological notation can expect to be successful which disregards the corresponding notations of other countries. We hope that the International Electrotechnical Commission may soon effect a successful start on the way toward international electrotechnical notation, although we cannot expect the work to be completed in a year, or even in 10 years.

MAGNET STEEL AND PERMANENT MAGNETISM.

The famous crown of Lombardy was of iron, and is claimed to have been constructed from that metal as a sign that the royal power was akin in substance to the sword. However that may be, there can be no doubt that the power of mechanical engineering, in our time, is vested in steel. Similarly, although not in precisely the same way, the power of electrical engineering resides in steel, for without this material dynamos and motors could hardly be entitled to practical consideration. We print on page 161 an abstract of an article, recently published in *Stahl und Eisen*, on "Magnet Steel and Permanent Magnetism," by Herr G. Mars. Not only this abstract, but also the original article, are well worthy of study by electrical engineers. The technology of steel has made rapid progress during the last decade. The vast world output of this material (over 100,000 tons daily) demanded and demands thorough investigation. The subject is very complex. Ordinary steel is partly a mixture, and partly a chemical compound, of iron, carbon and other elements in small quantities. The qualities of steel are affected markedly by the presence of what appear, on paper, to be trivially small quantities of extraneous elements. They are profoundly modified by the amount of carbon, and by the condition in which that carbon is present. An extensive literature exists on the subject, and a very large amount of chemical and physical investigation has already been published.

It has been supposed that, in general, mechanical and magnetic hardness were closely associated. That is, the belief has been general that in proportion to the hardness of steel as measured mechanically, the magnetic retentivity likewise increased. This retentivity is ordinarily defined as the ratio of the residual flux density to the maximum impressed flux density when a specified impressed magnetizing force is reduced to zero. In the case of the observations reported by Herr Mars, the retentivity was measured comparatively only, so that these retentivities are to be taken with some reserve. Nevertheless, they indicate clearly that although the mechanical hardness of carbon steel containing but small silicon and manganese additions increases to a steady maximum at and beyond 0.8 per cent of carbon, the magnetic hardness, or retentivity, reaches a maximum near 1 per cent of carbon, and then diminishes. It is pointed out in the article that the maximum retentivity corresponds to the entectoid carbon percentage point, or to that condition in which the structure is wholly pearlite. In this condition microscopical examination shows that the grain of the metal is finest when the hardening has been properly effected. If the carbon falls below this critical value, the steel cannot be hardened to the same degree. If the carbon increases above this critical value, the free iron present diminishes and carbide begins to permeate the mass.

From a practical standpoint, the research is most interesting in showing the magnetic superiority of the tungsten and chrome-tungsten steels. According to these results, the best commercial permanent magnets are obtainable from these alloy steels, although their degree of mechanical hardness does not appear to be remarkable. In the opposite direction of soft steel, suitable for armature and transformer cores, as well as for field-magnet castings, the article points out that silicon steel is particularly advantageous. This fact is now generally known, particularly since the publications of Hadfield, and availed of in electrical manufacturing. It is not yet known, however, just how the silicon improves matters. Silicon steel has now been used in transformer cores to prevent age increased hysteretic loss, for more than five years. It is to be hoped that much effort will be directed in the near future to such useful researches as that contained in the article here considered. Much importance lies in the publication of the results. Some manufacturers imagine that if researches of this character are kept secret in their factories they derive exclusive benefit therefrom. Technical processes are indeed a prerogative of local discovery, but technological researches usually do more good to the firm that publishes them than to the firm that conceals them. This important fact is beginning to be appreciated and followed by large manufacturing corporations. Special processes are available as industrial assets, but applied scientific knowledge or technology is actually available only in community.

Annual Meeting of Illuminating Engineering Society.

The fourth annual meeting of the Illuminating Engineering Society was held on Friday evening, Jan. 14, 1910, at 8 p. m., at the Machinery Club, New York. Immediately preceding the meeting an informal collation was served. There were present 45 members and guests. Among the latter were Messrs. Walter R. Addicks, F. S. Terry and E. N. Wrightington, of Boston, who made brief addresses. President Gartley in addressing the meeting said that the condition of the society has not been impaired during the past year in any way, and that he was particularly pleased with the new membership. While the membership has not largely increased, because of certain unavoidable conditions, there has been a material increase from the gas fraternity, which gives a better balance in the membership and forms a foundation that ought to produce results which can be built upon. The year has seen a number of important developments in illuminating engineering. More men have started to specialize in this work than ever before. Laboratories are giving more attention to the subject. Laboratories have been built by companies devoted exclusively to the subject of illuminating engineering, and colleges have taken a keener interest in the subject. The colleges are improving their study of physics, with a leaning more gradually to illumination.

The general secretary, Mr. Preston S. Millar, presented the report of the council to the meeting, which showed the society to be in a flourishing condition from all standpoints.

In commenting upon the report, the president referred to the unit of light. That unit marks the bridging of what was always a difficult point. It is the only unit that will be used by the National Bureau of Standards. The Constitution of the United States said that Congress shall have the power to fix on weights and measures. It might be advisable to have such a bill introduced in Congress. It is the duty of every member of the Illuminating Engineering Society, wherever he can and whenever he can, to insist that, sooner or later, all organizations connected with illumination shall adopt the photometric unit recommended by the sub-committee of the committee on nomenclature and standards at the last convention of the society, namely, the "lumen" as the unit of luminous flux.

The following gentlemen were elected to office for the year 1910: Dr. Edw. P. Hyde, president; Mr. V. R. Lansingh, vice-president; Mr. W. Cullen Morris, treasurer; Mr. Preston S. Millar, general secretary; Mr. L. B. Marks, Dr. E. B. Rosa and Mr. F. W. Lloyd, directors.

After being inducted into office President Hyde remarked that the policies of the society must continue to be aggressive, but sane; they must be broad, but definite; they must be highly diversified, but very unified. No better nor more comprehensive statement of the functions of the society can be found than the statement given in the Constitution: "Its objects shall be the advancement of the theory and practice of illuminating engineering and the dissemination of knowledge relating thereto." The new president expressed the hope that during the coming year all of those objects may be furthered, and said that if he should call attention to one more than to another of those objects, it would be the dissemination of knowledge.

President Hyde called attention to the consideration given to the question of separating the membership of the society, which raises the question, What is an illuminating engineer? He expressed the conviction that an illuminating engineer is a practitioner, but in order to practice, one must know, and the knowledge that is required of the illuminating engineer is highly diversified. It is not enough that he should simply know the ordinary engineering formula and data for putting the illumination from given sources of light in certain positions, or even for deciding the location of sources of light to accomplish certain illumination. He must also be appreciative of the requirements of art and architecture. He should know something of the science of light itself, and of the measurement of it. He should not be ignorant of the great opportunity for lighting that will benefit the race ultimately, and the great opportunity, or chance, of having a lighting installation which may ultimately tend to conduce to the serious harm of the human race. In other words, there is the engineering element, there is the architectural element, the physical, the physiological—even the psychological; there is the artistic element—all must be combined. The dissemination of knowledge should begin at home. There is a good deal of the proper knowedge in the Illuminating Engineering Society, but it is scattered. One man may be well versed in one branch, and another man in another branch.

Mr. E. Leavenworth Elliott, chairman of the committee to consider the feasibility of a division of classification of membership, presented his report. This report recommended that, since a constitutional amendment will be necessary to bring about such division, and as such amendment cannot be made earlier than at the next annual election of officers, the committee be continued in power, or that another committee be appointed to report a detailed plan with the necessary constitutional amendments to carry it into effect at the next annual convention of the society, as this will bring the matter before the largest representative gathering of members and offer the widest possible scope for discussion and action.

After a spirited and lengthy discussion a motion was made and carried that the report of the committee be accepted, and that it be directed to send a copy thereof, previous to the next annual convention, to each member of the society.

Charlotte (N. C.) A. I. E. E. Meeting.

The program of the special meeting of the American Institute of Electrical Engineers, to be held at Charlotte, N. C., on March 23, 24 and 25, 1910, of which note was made in these columns last week, has not yet been completed, but arrangements have already been made for the presentation of the following papers: "Economics of Hydroelectric Plants," by Mr. W. S. Lee; "Electric Drive in Textile Mills," by Mr. A. Milmow; "Calcium Cyanamid and Its Relation to Water-Powers," by Mr. Charles H. Baker; "Gas Engines in City Railway and Light Service," by Mr. E. D. Latta, Jr.; "Protective Devices for High-Tension Transmission Lines," by Mr. L. C. Nicholson. In addition to a number of attractive social features, the Southern Power Company has offered to place at the disposal of the members in attendance a special train for a tour of inspection of its Great Falls station at Great Falls, S. C., and of a 100,000-volt substation. The official headquarters will be at the Selwyn Hotel. A local committee of arrangements has been appointed as follows: Mr. W. S. Lee, chairman; Dr. W. Gill Wylie, Messrs. John H. Finney, C. E. Waddell, J. E. Sirrine, W. H. Riggs, A. M. Schoen, S. W. Cramer, E. D. Latta, Jr., F. M. Laxton, E. P. Coles, F. D. Sampton, C I. Burkholder, R. R. Laxton and J. W. Fraser.

The Charlotte meeting is not to take the place of the Institute's annual convention, which will be held as usual later in the year at a place not yet decided upon.

Next Ohio Electric Light Convention.

At the midwinter meeting of the executive committee of the Ohio Electric Light Association, held at Columbus, Ohio, Jan. 12, 1910, it was decided that the sixteenth annual convention of the association will be held at The Breakers Hotel, Cedar Point, near Sandusky, Ohio, July 26, 27 and 28, 1910. The committee also decided upon the subjects to be taken up in the program as follows: Experience with series-tungsten lamps for street lighting.—What is being done with electric vehicles in Ohio.—Electric heating devices and their progress.—Turbine troubles.—Methods of charging for power.—Best methods of metering current when sold for power and maintenance of such meters.—Central station facts and factors.—Low-pressure turbines and their operation.—What course should be pursued in getting new business in cities of 15,000 and less? There will also be papers by Prof. F. C. Caldwell, of the Ohio State

University, and by Mr. H. L. Booth, of Bellaire, Ohio, the subjects to be announced later.

A committee on general arrangements was appointed, consisting of Mr. E. A. Beckstein, of Sandusky, Ohio; Mr. T. D. Buckwell, of Toledo, and Mr. W. J. Hanley, of Cleveland. As chairman of the amusement committee Mr. H. H. Cudmore was appointed, and Mr. F. C. Coldwell, of Cincinnati, was made chairman of the entertainment committee. A ladies' division of the entertainment committee was constituted of which Mrs. A. A. Serva, of Ft. Wayne, Ind., is chairman.

The place selected for the convention this year is a resort on Lake Erie, which is somewhat more accessible than Put-in-Bay Island, where many of the association's conventions have been held in years past. It is believed that the convenience of access of this meeting place, combined with the fact that it is on the lake away from the heat of the large cities, will be conducive to large attendance. Mr. D. L. Gaskill, of Greenville, who is secretary, states that the entertainment features will be more elaborate than ever.

Conservation of Water Powers.

In his special message to Congress, on Jan. 15, President Taft stated that since March 4, 1909, temporary withdrawals of power sites have been made on 102 streams, which withdrawals cover 229 per cent more streams than were covered by the withdrawals made prior to that date. In discussing water-power control President Taft said:

"With respect to the public land which lies along the streams offering opportunity to convert water-power into transmissible electricity, another important phase of the public land question is presented. There are valuable water-power sites through all the public land States. The opinion is held that the transfer of sovereignty from the Federal Government to the territorial Governments as they become States, included the water-power in the rivers, except so far as that owned by riparian proprietors. I do not think it necessary to go into a discussion of this somewhat mooted question of law.

"It seems to me sufficient to say that the man who owns and controls the land along the stream from which the power is to be converted and transmitted, owns land which is indispensable to the conversion and use of that power. I cannot conceive how the power in streams flowing through public lands can be made available at all, except by using the land itself as the site for the construction of the plant by which the power is generated and converted and securing a right-of-way thereover for transmission lines. Under these conditions, if the Government owns the adjacent land—indeed, if the Government is the riparian owner—it may control the use of the water-power by imposing proper conditions on the disposition of the land necessary in the creation and use of the water power.

"The development in electrical appliances for the conversion of water-power into electricity to be transmitted long distances has progressed so far that it is no longer problematical, but it is a certain inference that in the future the power of the water falling in the streams to a large extent will take the place of natural fuels.

"In the disposition of the domain already granted, many water-power sites have come under absolute ownership, and may drift into one ownership, so that all the water-power under private ownership shall be a monopoly. If, however, the water-power sites now owned by the Government—and there are enough of them—shall be disposed of to private persons for the investment of their capital in such a way as to prevent their union for purposes of monopoly with other water-power sites, and under conditions that shall limit the right of use to not exceeding 50 years with proper means for determining a reasonable graduated rental, and with some equitable provision for fixing terms of renewal, it would seem entirely possible to prevent the absorption of these most useful lands by a power monopoly. As long as the Government retains control and can prevent their improper union with other plants, competition must be maintained and prices kept reasonable."

Decisions Affecting Foreign Corporations in Illinois.

At the meeting of the Electric Club of Chicago on Jan. 12 President F. P. Vose, who is a practising lawyer intimately connected with the electrical interests, called attention to three important decisions handed down by the Appellate Court on Dec. 23 affecting foreign corporations doing business in Illinois.

The first was that of the Frank Simpson Fruit Company vs. the Atchison, Topeka & Santa Fé Railroad Company, holding in effect that the mere commencement of an action in any one of the courts in Illinois is the exercise of corporate power in Illinois. A foreign corporation which is not qualified to do business in Illinois by complying with the terms of Chapter 32 of the Revised Statutes, entitled, "An Act to Regulate the Admission of Foreign Corporations for Profit to Do Business in the State of Illinois," subjects itself to the prohibition found in the act and is debarred from maintaining its suit in the Illinois courts. Such a corporation, lacking the right to institute a suit, when it does so in violation of this prohibitory statute, the tribunal, whose jurisdiction is thus invoked, is without power to grant relief or to take cognizance of such suit or to render the judgment sought.

The second suit was that of the Erie & Michigan Railway & Navigation Company vs. the Central Railway Equipment Company, which, in effect, held that a foreign corporation never authorized to transact business in Illinois and to sue and defend in its courts cannot maintain a suit for relief from the consequences of a contract made in Illinois, which it had then no power to make and upon which it had not then the right to maintain any action, either at law or in equity, in the courts of Illinois. This means, apparently, that all contracts entered into in Illinois by a corporation organized in any other State are void unless such corporation has, prior to entering into the contract, obtained a license to do business in Illinois.

To the same effect is the decision in the case of the United States Gypsum Company vs. the Central Railway Equipment Company, decided the same day, which held that where a corporation undertakes to guarantee the full performance of a contract entered into by an unlicensed foreign corporation in Illinois, exercising its corporate powers in Illinois in violation of this law, such guarantee is without effect and void, as in contravention of the public policy of the State of Illinois following the well-known decision of the United Lead Company vs. the Reedy Elevator Manufacturing Company, 222 Ill., 199-202.

Proposed Chicago Subway.

With the sanction of the City Council of Chicago, a bill is pending in the Illinois Legislature authorizing the building of the long-discussed subway in Chicago. It is provided in the bill that the term "subway" shall include not only street-railway lines, but also conduits, pipes, tubes, passageways, tunnels, galleries and openings. The proposed law is to apply to all the cities in the State, and it is provided that each city shall have the power to acquire the property necessary for the purpose of a subway. In addition to the transportation of persons and property, the transmission of water, steam, sewage, gas, electricity, etc., is provided for. The city may construct the subway and lease the privileges of using it, if desired. Provision is also made by which the city authorities shall require all pipes in any street in which the subway is constructed to be placed in the subway, and the city shall have the right to collect compensation for the use of subway space. Any lease or grant for the use of the subway shall not be for a longer period than 20 years. An important provision is that if the city grant the use of the subway by a franchise, such franchise shall not go into effect until 60 days after the passage of the ordinance. Within that period a petition may be filed, if signed by 10 per cent of the voters, by which the franchise may be submitted to a referendum vote of the citizens.

Governor Deneen is in favor of the subway bill, and he has recommended immediate action by the Legislature, inasmuch as the present session will be adjourned on Jan. 28 or thereabouts.

The Morgan Telephone Deal.

Mr. Frank A. Davis, of Columbus, Ohio, was made president of the United States Telephone Company at a meeting held in the Electric Building, Cleveland, on Monday afternoon of last week. This is in accord with the wishes of Mr. J. P. Morgan, which were outlined in these columns in the issue of Jan. 13. Mr. Davis succeeds Mr. James S. Brailey, Jr., who has been at the head of the company for the past year or more. The directors chosen are as follows: Messrs. Frank L. Beam, Mount Vernon; S. W. Stevens, New York; E. R. Sharp, Columbus; F. R. Huntington, Columbus; H. L. Daugherty, Columbus; Nicholas Monserrat, Columbus. Mr. Beam is president of the Ohio Independent Telephone Association; Mr. Stevens is a representative of J. P. Morgan & Company; Mr. Sharp is treasurer of the Columbus Citizens' Telephone Company, of which Mr. Davis is president; Mr. Huntington is a banker and representative of the Morgan interests in acquiring the Columbus company; Mr. Daugherty was attorney for the Independent interests for some years, and Mr. Monserrat is a business man of Columbus. The men they succeed are Messrs. James S. Brailey, Jr., Henry A. Everett, Barney Mahler, E. W. Moore, A. H. Bauer and Claude Ashbrook. Old directors who hold over in the reorganization are Messrs. E. G. Tillotson, Charles A. Otis, Clarence Brown, H. C. Stifel, D. J. Cable and Frank A. Davis.

Messrs. Henry A. Everett and James S. Brailey, Jr., resigned from the board of directors of the Cuyahoga Telephone Company, and were succeeded by Messrs. J. B. Fay, of Cleveland, and F. W. Stevens, of New York. Mr. E. G. Tillotson remains as president of this company, but the office of vice-president, formerly occupied by Mr. Brailey, will not be filled at present.

Mr. F. W. Stevens was made a member of the board of directors of the Toledo Home Telephone Company the next day after the meeting at Cleveland, and Mr. James S. Brailey, Jr., was retained as president. Four other new directors, all Toledo men, were chosen. Messrs. Clarence Brown, of Toledo, and H. C. Stifel and A. H. Bauer, of St. Louis, were retained on the board. Mr. Stifel has been actively opposing the deals made by Mr. Brailey and others.

Owing to the fact that St. Louis interests are still represented on the board of the United States Telephone Company, as well as on that of the Toledo Home Telephone Company, rumors have gone out that the United States and the Continental Telephone & Telegraph Company will work in harmony and that the plans for an independent long-distance system from the Mississippi River to the Atlantic coast cities will yet be realized. However that may be, the selection of men for the different boards and the changes made present a problem for the layman to study.

Mr. H. B. McGraw, attorney for the minority stockholders of these companies, characterizes the reorganization as a blind to lead the public to the belief that they will be maintained upon an independent basis. He says that the selection of Mr. Frank A. Davis, who stands well in the good graces of the Independents, as president of the United States, and the retention of Mr. Tillotson, a popular and well-known business man, at the head of the Cuyahoga Telephone Company, is a move to allay the fears of the stockholders and other Independents who would fight any combination with the Bell interests. Mr. McGraw sees in it all only a well laid plan to prevent further legal complications and to give time for bringing about such other moves as may be decided upon.

Mr. E. G. Tillotson, president of the Cuyahoga, has issued a statement in which he says he has been authorized by J. P. Morgan & Company to say that the Independent companies recently purchased by the firm are not under contemplation for connection with the Bell companies, now or in the future, and that there will be no coalition of any sort.

Amended petitions will be filed by Attorney H. B. McGraw in the suits recently brought to restrain the alleged attempt to transfer stock of the Independents to Bell interests. J. P. Morgan & Company will be made parties defendant in the amended petitions. It is stated that the depositions of J. P. Morgan and other members of the firm, as well as that of Mr. Theodore N. Vail, president of the American Telephone & Telegraph Company, will be taken under the new plans. Attorney-General Denman has informed Mr. McGraw that he will furnish copies of the letters received from J. P. Morgan & Company, Mr. Theodore N. Vail and others, for which he asked some time ago.

Following all the agitation of the past few weeks, it is reported from Columbus that a bill is being prepared for introduction in the General Assembly that will require interchange of business over competing telephone lines and regulate toll rates. This may be made a part of the general utilities bill which is being prepared. A bill of this kind was prepared for the last General Assembly, but it failed of passage.

Statistics of New York Central-Station Service.

The lighting and power service supplied on the Island of Manhattan, New York City, from central stations, was as follows on Dec. 1, 1909:

Service connections	51,933	
Customers	92,093	
Meters	111,434	
Incandescent lamps	4,057,170	
Arc lamps	40,477	
Vapor arc lamps	1,279	
Heating appliances	1,158	kilowatts
Storage batteries	5,096	"
Electric motors	233,834	"

Proposition for Rebuilding Austin (Tex.) Dam.

Mr. J. C. Dumont, an engineer and contractor who is building a large dam across the Colorado River at Marble Falls, Tex., 60 miles above Austin, has submitted a proposition to the municipal government of Austin for the rebuilding of the great dam across the Colorado at this point. This dam and hydroelectric plant were destroyed by a flood in the river nine years ago, entailing a loss of $1,600,000. The original dam was erected at a cost of $1,000,000. Mr. Dumont, in his proposition, estimates that he can rebuild the dam on new plans at a cost of about $350,000. He agrees to finance the proposition if the city will give him a lease of the water-power and the exclusive control of the hydroelectric plant that he proposes to install. He asks that the city make a contract for power with him at the rate of 2 cents per kw-hour and that it install dynamos at its water-pumping plant. The proposed contract allows the city to make subcontracts with consumers for the use of electric power at whatever profit it may see fit. Mr. Dumont reserves the right, however, to build transmission lines and to furnish power to outside points and industries at a rate not to exceed three times that which he charges the city of Austin. At the expiration of 15 years the lease expires and the dam and hydroelectric plant would pass into the hands of the city. It is probable that Mr. Dumont's proposition will be submitted to a vote of the people of Austin.

Cedar-Pole Industry Discussed at Convention of Northwestern Cedarmen's Association.

The fourteenth annual convention of the Northwestern Cedarmen's Association, composed of producers of cedar poles and other cedar products, was held in the Hotel La Salle, Chicago, on Jan. 11 and 12. About 60 members and visitors attended the convention. President Ernest L. Clark, of Chicago, was in the chair, and at the opening session he read his annual address. Mr. Clark began by making a rather pessimistic reference to the cedar business of last year, but he said that there was hope of at least a living range of prices in the year 1910. In 1909, he said, there was no trade to speak of. Nevertheless, pole stocks on Jan. 1, 1910, were fully 20 per cent less than what they were a year before. The output of this present winter will not be one-half of what it was last winter, and miscellaneous stocks in the hands of "scalpers" and non-members of the association

have all been cleaned up. In the speaker's opinion, the demand for poles in 1910 will be better than normal, and dealers are warranted in holding their poles for a fair margin of profit. "The company that disposes of its material early this year," said President Clark, "will be the one that makes the least money. You have held on patiently for a living margin during the depression; now why be overanxious to dispose of your stock when much better times are coming?" Mr. Clark in his address praised the work of Secretary H. H. McKinney, of Minneapolis, and urged hearty co-operation on the part of the members with the secretary's office. Mr. McKinney gives his undivided attention to the association's work.

The report of the secretary, next presented, also alluded to the dullness of the cedar market and spoke of the work accomplished during the 3½ months in which Mr. McKinney had filled the office. The secretary referred to the issuing of the freight-rate book, with Rexton, Mich., as the basic point for computing rates. During 1909 six firms withdrew from the association and three firms were added. The association at present consists of 32 members. Speaking of the report of the amount of white-cedar stock on hand Jan. 1, 1910, previously distributed to members, Mr. McKinney said that it was not wholly satisfactory and urged that all members send in their reports to his office in time to make a satisfactory compilation.

Treasurer W. B. Thomas, of Manistique, Mich., presented his report showing total receipts during the year of $3,784.66 and disbursements of $2,578.03, leaving a balance on hand of $1,206.63.

Reporting for the committee on the freight-rate book, Mr. H. S. Gilkey, of Minneapolis, said that the present book had been kept up to date and no new book would be needed probably for some time, as the secretary would continue to send out rate correction sheets.

President Clark reported for the committee appointed to ask the Idaho cedar producers to co-operate with the Northwestern Cedarmen's Association. He said that he found that the Idaho men were not inclined to join the organization, and he was convinced that the association would gain little by its doing so under existing conditions in Idaho. It would be well, however, to make an effort to secure accurate information concerning Idaho stocks of poles.

At the afternoon session of Jan. 11 Mr. J. W. Benham, of Chicago, reported briefly for the legislative committee. An effort has been made to have the tariff modified so that the duty on cedar products will be made specific instead of ad valorem. Nothing has been accomplished in this direction, however.

From the railroad committee, President Clark reported that the railroad companies in Michigan had raised the minimum weight to a figure higher than the cars could be loaded. Mr. H. P. Grover, of Grand Rapids, Mich., mentioned that the minimum weight on poles—36,000 lb. for cars 36 ft. to 40 ft. long—could be achieved, but not always in a box car. The box-car minimum should be 24,000 lb.

After the report of the post and shingle committee had been received and discussed, Mr. A. T. Naugle, of Chicago, reported for the pole committee. He mentioned the fact that the reduction in the stock of poles on hand was fully 20 per cent compared with the corresponding stock of a year ago. It was decided that in the future reports of stock on hand the various sizes of poles—20 ft., 25 ft. and longer—be kept separate.

In relation to the matter of inspections it was decided, on motion of Mr. C. H. Worcester, of Chicago, that all applications for inspection be made through the secretary's office and that inspection shall be made by regularly appointed inspectors and only for association members. On motion, it was decided that a committee be appointed to prepare a set of rules governing the matter of check weighing and providing for weighing inspectors. It is intended by this means to secure information as to the correctness of weights, the condition of cars, etc.

On motion of Mr. W. C. Moss, of Minneapolis, the secretary was instructed to send out weekly reports to members notifying them of changes in tariffs.

The report of the nominating committee was the first order of business at the session of Jan. 12. This committee consisted of Messrs. H. S. Gilkey, Minneapolis; J. C. Kirkpatrick, Escanaba, Mich.; T. P. Bradley, Duluth, Minn.; J. W. Benham, Chicago, and C. H. Worcester, Chicago. On the recommendation of this committee the following officers were elected:

President, Mr. T. M. Partridge, Minneapolis; vice-president, Mr. J. E. Gerich, Milwaukee; treasurer, Mr. W. B. Thomas, Manistique, Mich.; director for one year, Mr. H. S. Gilkey, Minneapolis; director for two years, Mr. E. L. Clark, Chicago; director for three years, Mr. L. A. Page, Jr., Minneapolis. Mr. Partridge, the new president, was escorted to the chair and assumed charge of the proceedings. He is president of the T. M. Partridge Lumber Company, of Minneapolis, and is not only a strong and influential lumberman, but a great favorite with other members of the association as well.

A vote of thanks was extended to Mr. Clark, the retiring president, for the zeal manifested during his term of office. The secretary was instructed to take appropriate action in view of the fact that Mr. P. W. Rober will soon leave this country for a trip around the world.

There was considerable supplementary discussion of the relation of the association to the railroads and to the Interstate Commerce Commission. Upon Mr. Worcester's motion, the railroad committee was instructed to forward to the commission a set of resolutions commending the minority report of Judge Prouty, of the commission, in the matter of private "tap lines" connecting with main-line railroads. The convention was then adjourned.

An enjoyable banquet was given on the evening of Jan. 11 in the Hotel LaSalle. The dinner was an excellent one, but there were no set speeches, although Mr. E. H. Valentine, an honored guest, made a few remarks.

The Single-Phase Series Motor.

At a meeting of the American Institute of Electrical Engineers, held on Jan. 14, a paper entitled "The Space Economy of the Single-Phase Series Motor" was presented by Prof. W. S. Franklin and Mr. S. S. Seyfert. The authors stated that the chief limitation encountered in the design of single-phase motors for heavy railway service is that of size. It is difficult to build a single-phase motor of sufficient horse-power rating in the limited space between the drivers on a locomotive. The authors suggested removing the commutator from the motor region, making the armature stationary, arranging the field structure to revolve, and placing the stationary commutator at some convenient point where revolving brakes may be positively driven by the revolving field structure. For this arrangement it was claimed that all of the available space between the wheels would be occupied by active material which would be utilized to the best advantage.

On account of the fact that in a single-phase series motor the armature should be magnetically stronger than the field, making the armature structure external to the field structure possesses over the usual arrangement the following advantages: (1) It presents more available space for the windings. (2) It makes possible a material shortening of the end-connections of the compensating windings without lengthening the end-connections of the armature windings. (3) It makes possible the removal of all non-sparking devices from the motor region proper, thereby relieving the designer of every limitation in the use of resistance leads or other non-sparking devices except the limitation of cost and weight; and (4) it makes possible the detaching of the commutator and the utilization of the large amount of space ordinarily occupied by the commutator for motor iron and motor copper.

In commenting on the changed arrangement of the armature and field structures the authors stated that "what may at first sight appear to be a disadvantage in the detaching of the commutator is the necessity of driving the brush mechanism by gearing, but the transmission of the power required for this purpose does not present a serious problem; indeed, it would

seem that the advantage of having the commutator and brushes always in view and always easily accessible would counterbalance any mechanical disadvantage involved in the detaching of the commutator."

A description was given of a non-sparking device based upon the use of leads passing great impedance for any short-circuit current and being almost non-inductive for the main line current. When the inductive leads were employed the commutation was entirely satisfactory even when the e.m.f. between adjacent commutator bars at the brush position was 19 volts.

In discussing the paper Mr. S. M. Kintner remarked that the arrangement proposed by the authors did not result in an increased output in horse-power per pound of active material, the actual increase in output being accompanied by an increase in weight which was rendered possible by utilizing space external to the motor for the commutator. He expressed doubt as to the success of the external commutator in practical service. Concerning the sparking, Mr. Kintner said that when the short-circuit e.m.f. is not over 4 volts the brush contact resistance is sufficient to limit the short-circuit current to a safe value.

Mr. E. H. Anderson expressed the opinion that the gain in output obtained by reason of the changed construction would not compensate for the added complications.

Mr. E. F. W. Alexanderson drew attention to the close agreement in results of design obtained by the different manufacturers of single-phase railway motors. For example, a single-phase series-repulsion motor designed for 150 hp, 600 r.p.m., and arranged for use with 36-in. wheels, has a weight of 5900 lb., which value agrees closely with recent designs of other single-phase types. The determining feature in the design of railway motors is usually the starting torque rather than heating and commutation under running conditions.

Mr. S. S. Seyfert outlined the results of certain tests showing that the armature iron losses in a single-phase motor are always greater than those in a direct-current motor using the same value of field flux even when the armature revolves at synchronous speed.

Mercury Vapor Lamps.

Mr. George C. Keech gave a talk at the regular noonday luncheon of the Chicago Electric Club, Jan. 12, on mercury-vapor lamps. He said that of several types of mercury-vapor lamps that are manufactured only one is made in the United States. Among the other types he mentioned the high-temperature lamp made in Europe using the quartz tube. As any mercury-vapor lamp, unless enclosed in glass, gives out ultra-violet rays which pass through quartz and are very injurious to the eyes, it is obviously unsafe to use the quartz lamp unless surrounded with a glass globe. Several years ago a combined incandescent and mercury-vapor lamp was brought out in Germany, but evidently has not proved a commercial success. The mercury-vapor lamp used commercially in this country is a result of the inventive effort of Mr. Peter Cooper Hewitt. The mercury-vapor lamp was unstable and uncertain before Mr. Hewitt began his experiments, but his experiments established the necessary factors to produce a lamp which would continue burning steadily. These experiments covered a large number of conditions as to voltage, current, sizes and lengths of tube.

Mr. Keech demonstrated the principle of starting the mercury-vapor lamp by tilting the tube which he held in his hand. The mercury-vapor arc which follows the breaking of the stream of mercury flowing from one end of the tube to the other during the tilting process is continued for the full length of the tube when the lamp is at rest in the inclined position in which it normally operates. He also exhibited a short double-tube lamp with magnetic tilting mechanism which renders it automatic when starting.

He told some amusing stories regarding the commercial application of the lamp and its peculiar greenish color, in which red rays are lacking. When used in a livery stable, the owner was astounded to find his horses purchased for bay had turned sorrel. He asked one of the employees why he was using hay for bedding instead of straw. Upon being assured that really straw was being used he asked why not feed the horses on straw since it looked like hay. A commission merchant who had equipped his place with mercury-vapor lamps was asked to buy a load of melons. When some of them were cut open they showed a color which indicated they were near decomposition, and he bought the load at a small price.

Mr. Keech called attention to the efforts made by the members of the Illuminating Engineering Society for the past few years to reduce the injurious effects of artificial illumination on the eyes. He outlined the requirements of a successful lamp as one with high enough efficiency to give good general illumination with a reasonable wattage per square foot, and one which gives its light from a large surface. He also suggested that the lamp should be placed so as to give by night the same general direction of light as the daylight received from windows or skylights. These requirements can usually be fulfilled by the mercury-vapor lamp.

The mercury-vapor lamp has been found especially agreeable by printers setting new type from cases. The glare from type is annoying when small sources of light are placed near the cases. The lamp is also excellent for machine shops because of the absence of glare from bright metal parts. The light comes from a long surface and is hence better diffused than that from most other sources.

The lamp has played an important part in taking moving pictures under conditions where the taking of such pictures would be almost impossible without this lamp. Pictures can be taken with short exposure under this light because of its high actinic value.

In the discussion which followed, Mr. E. M. Lake jocosely referred to the extremely low efficiency of most sources of light when compared to the energy contained in the coal. However, the mechanical engineer who had referred to the efficiency of the electrical engineer in terms of thousandths of a per cent evidently forgot the extremely low efficiency of the mechanical transformation of the thermal energy of coal into power from a steam engine. The transforming of the mechanical into the electrical is accomplished with relatively good efficiency. The transformation from electrical to luminous energy is at very low efficiency, but the mercury-vapor lamp marks a great advance over the old arc and incandescent lamps.

Electrical Show at the University of Illinois.

The third show given by the Electrical Engineering Society of the University of Illinois will be held on Feb. 10, 11 and 12. There will be exhibits showing all applications of electricity to the industrial arts. Some of the "Co-eds" of the university will make coffee and candy in the electric way. There will be electric meters which register in dollars and cents and their action will be explained so that every householder who attends the show will know how his meter works. A monorail is in course of construction and will undoubtedly prove interesting to many. The more spectacular features will not be overlooked. The electric fountain and the miniature Niagara will be on exhibition, and a high-frequency demonstration will be very much in evidence. The principles of the telephone and telegraph, both with and without wires, will be explained. Pure amusement for the visitors will be furnished by the sparking jig and "stunts" of a similar nature. The illumination exhibits will be among the most interesting as the comparative cost, light and optical effects of various kinds of electric light and systems of lighting will be demonstrated.

It has seemed appropriate to do most of the advertising for this show by electrical means. With this in view, the advertising department has laid its plans. Two large skyrockets have been designed and are in course of construction. One of these will be placed in Champaign and the other in Urbana. The tails of these rockets are 50 ft. long, and the burst of colored streamers and "E. E. Show" at the end will be a novelty to the university community.

This show is not a money-making scheme in any sense, but it means the expenditure of much time and labor and considerable money; it is not given to advertise any special electrical apparatus, for in most cases the apparatus is constructed by the students themselves.

The students give a number of reasons why they desire to hold the show this year. They hope to get some practical experience in electrical work by the application of what they have learned. They hope to furnish something amusing and at the same time something instructive to the people who attend. They hope to demonstrate to the State and to electrical companies that Illinois is turning out a brand of efficient engineers as practical and as energetic as any in the country.

At the university there are 311 students in electrical engineering, of whom 57 are in the senior class.

Baltimore Electrical Contractors' Association.

At a special meeting of the members of the Electrical Contractors' Association of Maryland, held last Tuesday night, drastic changes in the existing electrical laws of the State were advocated by the legislative committee of the organization. After approval by the association, the proposed changes in the laws will be advocated at Annapolis. The committee, composed of Messrs. Joseph M. Zamoiski, chairman; J. Frank Eline, John K. How and Joseph B. Dresich, recommended the appointment of a State inspector, who will be empowered to enforce the law relative to defective work and workmanship by incompetent men; also a non-paid State electrical commission and that the present system of allowing any man who can pass a simple examination and buy his license to contract to do electrical work be discouraged.

The annual meeting of the association was held on the Tuesday previous, when the following officers were elected: President, Mr. Joseph M. Zamoiski; vice-president, Mr. Joseph B. Dresich; treasurer, Mr. Stanley B. Prather; secretary, Mr. William Grey. Executive committee: Messrs. L. A. Herstein, John L. Dobler and Joseph A. Becker.

Chicago Electrical Show of 1910.

Under the same management as in previous years, but presenting an entirely different appearance, the fifth annnual Electrical Show of the Electrical Trades Exposition Company was thrown open at the Coliseum, Chicago, at 1 p. m. on Jan. 15, to continue to Jan. 29, inclusive. The show is open daily from 10 a. m. to 10:30 p. m., except Sundays. It presents a beautiful spectacle, and, judging by the opening day, the attendance will be larger than ever before. The Exposition company is composed of representative electrical interests of Chicago. Mr. Samuel Insull is president and Mr. H. E. Niesz is manager of the company. The show is not only really "electrical," but it is also a popular attraction, with its many novelties, its beautiful lighting effects and good music by Weber's Band. Souvenirs are given to paid-admission visitors on Mondays and Tuesdays, and there are "special days" devoted to electrical organizations as follows: Jan. 19, Electric Club of Chicago; Jan. 20, Illuminating Engineering Society; Jan. 21, Sons of Jove and Wisconsin Electrical Association. In addition, Jan. 22 is spoken of as "Students' Day"; Jan. 25 as "Telephone Day," and Jan. 26 as "Aviation Day." Telegraph and long-distance telephone facilities are provided, and the Chicago postoffice has installed inside the building a pedestal letter box, from which mail collections are made six times daily.

An interesting aand popular feature of the show is the lecture hall in the southeast corner of the building. Here there are chairs for about 300 persons, and Mr. M. M. Wood, well known for his entertaining capabilities in this direction, delivers two lectures every afternoon and two every evening. The lectures are illustrated by moving pictures and are not only popular and entertaining, but also of educational value in showing the progress made in the development of electric lighting and power. An ingenious "transformation scene" illustrates the succession of the tallow candle, the kerosene lamp and the electric light. Mr. Wood's lectures are from 2 to 2:45, 4 to 4:45, 7 to 7:30 and 8:20 to 8:50 p. m. In the same hall, Mr. William Bruce Leffingwell displays beautiful moving pictures of the Yellowstone Park and other scenic attractions, interspersed with views of more direct electrical interest.

In describing the show, it will be considered under three headings—the illumination, the Wright aeroplane shown by the United States Government with wireless demonstrations, and the exhibits.

ILLUMINATION—DECORATIVE AND USEFUL.

For the last three years the illumination of the Chicago Electrical Show has been characterized by originality of design and novelty of effect. In 1908, as described in the *Electrical World* of Jan. 11 of that year, the limit was practically reached in outlining, festoon and chandelier effects. That year the ceiling was draped in light colors; festoons were hung at regular intervals and these were supplemented by spherical papier maché chandeliers of original design.

In 1909, since the effect of light and brilliancy apparently had been worked to the extreme in the previous show, an entirely different scheme was used. The ceiling was covered with black, and small lamps of low candle-power were scattered over the ceiling in such a way as to give the impression that the roof had been taken off the building and that one was looking up at the stars. The useful illumination was obtained by lamps mounted on the booth fittings.

This year, 1910, a novel spectacular effect has been attempted, which is proving as successful in its way as the plans of previous years. The useful lighting of the exhibits is accomplished by means of tungsten lamps in imitation art-glass globes made of translucent, colored paper, mounted on the corner posts of the booths, and by tungsten lamps under imitation art-glass domes suspended over the top of each space. Most of the lighting is obtained from five 100-watt lamps under each dome. These lamps are equipped with Holophane extensive reflectors, so that the light is directed downward for the illumination of the exhibits and is not wasted to any extent in the upper part of the building. On the corner posts are 60-watt tungsten lamps in the imitation art-glass globes before mentioned. Between the corner posts are larger posts surmounted with 150-watt tungsten lamps.

The spectacular illumination, which is entirely independent of the useful illumination, is accomplished by throwing beams of light from projector lanterns among streamers of ribbon and tinsel suspended from the ceiling of the building. These streamers hang straight down with their lower ends free. They are suspended at intervals of 2 ft. to 4 ft. By a rough estimate the number of streamers is placed at 3500. Of the tinsel streamers about one-half are gold and one-half silver. The ribbon streamers are one-half yellow and one-half gray. There are three 80-amp, 30-in. General Electric projector lamps at each end of the building, making six in all. The purpose of these is simply to illuminate the moving streamers. The streamers are of different lengths. The projectors have colored glass slides for varying the effect.

Along the edge of the balcony is a row of imitation art-glass hemispheres mounted on ornaments, these hemispheres being illuminated, and of a design in keeping with the globes and domes around the booths.

The floor area of the building aggregates 51,000 sq. ft. The main building is about 300 ft. long by 170 ft. wide. The distance from the floor to the highest point of the ceiling is about 70 ft.

The designers have succeeded in producing what they evidently intended, namely, a kind of "fairyland" effect. In looking across the building toward the roof the impression gained is that there is an indefinable gauze somewhere between the observer and the roof. The spectacular illumination from the projector lamps is looked after by the illuminating engineering department of the General Electric Company. Major R. H. Ryan, a brother of Mr. W. D'A. Ryan, is in charge. The gen-

eral decorative and illumination design for the last three years has been made by D. H. Burnham & Company, architects. The accompanying pictures give an idea of the original, but the effect on the eye is more pleasing than the photographs indicate.

SIGNAL SERVICE AEROPLANE AND WIRELESS DEMONSTRATION.

Perhaps the most striking feature of the show is the Wright aeroplane exhibited by the United States Government and which is a part of the working equipment of the Signal Service of the army. This machine, suspended in the center of the hall, is the identical aeroplane in which Mr. Orville Wright flew from Fort Myer, near Washington, to Alexandria, Va., and which the Government purchased for $30,000.

The machine has been fitted for demonstrations of wireless telegraphy, and is the first aeroplane to be thus equipped, although owing to the large amount of metal and wiring in the Coliseum the exhibit is considered only a rough experiment under disadvantageous circumstances. The ground station has been fitted up in the Coliseum Annex, and is equipped for both transmitting and receiving.

In applying wireless equipment to the aeroplane, Lieut. Ben D. Foulois, who has charge of the Signal Service exhibit, in conjunction with Mr. Frank L. Perry, of Chicago, has devised a system of antennas and wiring, making use of the army portable wireless telegraph set. The antenna wires are confined within the framework of the aeroplane, avoiding interference with the movement of the propellers or the operation of the machine. The top antenna consists of three parallel stranded copper wires, about No. 14 in size, strung horizontally on cleats just beneath the upper main surface of the aeroplane. The army wireless telegraph sending and receiving set may be seen in

Fig. 1—View from Balcony Showing U. S. Army Aeroplane.

the photograph at the (spectator's) left of Lieutenant Foulois, who is shown in the picture. One stranded wire from this wireless set makes connection at the center point of the three-wire overhead antenna system.

Combined with the upper antenna surface to produce in effect a vertical Hertz oscillator, the lower antenna comprises a loop of wire strung around the edge of the aeroplane's "runners," an arrangement which does not interfere with the starting or landing of the machine in actual service. This lower antenna loop is connected to the operator's instrument by wires led in a rubber tube through the muslin of the lower plane.

In the Coliseum Annex is the ground sending and receiving station, where the Signal Service men have set up their tent and equipment, and are demonstrating the use of the apparatus. The regular army antenna pole and "umbrella antenna" is employed. Experiments will also be made with wireless telephony during the period of the Electrical Show.

Besides the apparatus described, the Signal Service exhibit includes a number of interesting aeronautical pictures, presented by Major Squier to the American Society of Mechanical Engineers about a year ago.

THE CENTRAL-STATION DISPLAY.

While no doubt the United States Government is the most important exhibitor at the show, the one occupying the most space is the Commonwealth Edison Company, of Chicago. The company has three distinct exhibit spaces. One of these, at the north end of the Coliseum, is devoted to an industrial power exhibit. Another, at the south end, displays a garage for electric automobiles. A third is near the northwestern corner of the exhibit floor, and here the Electric Shop of the Commonwealth company displays a number of beautiful and costly portable lamps, which constitutes one of the most attractive exhibits in the show. Electric heating appliances and other household conveniences are also shown here.

The idea of the power exhibit is to display electrically operated machines of various kinds in actual operation, demonstrating to visitors the many and varied uses to which electric power may be put. Nearly all of the motors used are three-phase, alternating-current machines of both constant speed and variable speed.

A special feature that attracts much attention is an exhibit of artificial refrigeration by the Automatic Refrigerating Company. A large refrigerator, supplied by the Paul J. Daemicke Company, such as is used in butcher shops, is shown in connection with a large refrigerating plate-glass showcase. Fresh meats are attractively displayed in this case, being kept at the proper temperature automatically by means of an ammonia compressor controlled by thermostats and operated by a 3-hp motor.

Near the refrigerating system is shown the Hall "Kitchen King," an electrically operated machine for mashing potatoes, making mayonnaise dressing, straining soups, etc., in large restaurants, hotels and public institutions. Here also is found a decided novelty—the "electric altar-bread oven," for baking by

Fig. 2—Central Station Industrial Power Exhibit.

the ideal means of electric heat the bread used in the communion service.

Quite the opposite of the refrigeration display is its neighbor, an electric furnace, made by the General Electric Company, in which very high temperatures are produced for the tempering and annealing of steel. Near this is a popular display showing the making of tin biscuit cutters used by cooks in stamping out biscuit dough for the oven. The punching, stamping and crimping machines used in making these devices are electrically driven and the soldering is down by Vulcan electric soldering irons. Five men are constantly employed in plain view of all spectators in making these biscuit cutters, which are given away to ladies as souvenirs.

There is a machine for spinning rivets, another for spinning brass, and a third for making small brass turnings, all shown in operation, and all electrically driven, of course. There is also an electric lawn mower and a micrometer grinder, such as may be used in garages and machine shops. A power hack-saw, from the McDowell-Stoder Company, is particularly interesting as

showing the application of speed-reducing gear enabling a high-speed motor to operate a low-speed machine.

The office of the Commonwealth Edison power exhibit is in the center of the large north space. It is attractively arranged and contains tables decorated with handsome lamps, palms, ferns, etc. The entire west part of the exhibit is devoted to a demonstration of the applications of electricity in printing, binding and embossing. A Lanston Monotype machine used for type casting and setting is shown in operation, and there is a large Miehle printing press driven by a variable-speed, three-phase motor, and a Challenge Gordon job-printing press operated by a variable-speed, single-phase motor. A Dexter paper cutter and folding machine, a Latham stitcher and other machines used in printing, electrotyping and engraving are to be seen at work in this exhibit, all electrically driven. The work turned out here is an attractive souvenir in colors, which is printed, folded and bound before the eyes of the spectators.

At the distant end of the Coliseum, in the Annex, is another exhibit of the Commonwealth Edison Company, consisting of a model electric garage which illustrates particularly the charging of vehicle storage batteries from alternating-current service, using both the single rectifier and the six-circuit public-garage rectifier. One conspicuous feature of this display is a portable garage 12 ft. x 18 ft., designed to be set up on the owner's premises. This is provided with outlet plugs, and in it an electric pleasure vehicle is shown charging by the use of a rectifier. In the public-garage exhibit there are air compressors for inflating tires, as well as various other electric automobile supplies. Two electric delivery wagons are shown and also a number of batteries on trays, as well as batteries taken apart so that their construction can be clearly understood. Messrs. E. W. Lloyd, D. H. Howard, George H. Jones, J. J. Schayer, L. E. Marshall and others represent the company at the various exhibits.

The exhibits of the manufacturers of electrical appliances, about 100 in number, are varied and interesting, and contain a number of new things, as an electrically heated bathrobe, instantaneous water heaters, electrical glassware in structural forms to look like marble, electric marking pencils (using electric heat), 30-volt farm-lighting set, intensified arc lamps, small drawn-shell motors, smoke recorder, the smallest electric flatiron, the smallest vibrator, electric hammer and a 5000-revolution ⅛-hp motor directly connected to a fan in a vacuum cleaner. These exhibits are briefly described in an article presented elsewhere in this issue.

ILLUMINATING ENGINEERS AT THE SHOW.

In the Coliseum auditorium, Thursday evening, Jan. 20, the Chicago Section of the Illuminating Engineering Society will hold a meeting to be devoted to the topic of "Indirect Lighting." Discussion of the subject from several viewpoints will be led by the following gentlemen: "As to Maintenance," Mr. F. J. Pearson; "As Viewed by the Oculist," Dr. Henry Gradle; "From the Architect's Standpoint," Mr. George W. Carr; "Its Efficiency," Mr. George H. Jones; "Recent Adaptations," Mr. J. R. Cravath. The meeting will be preceded by a dinner in the Coliseum restaurant, giving the illuminating engineers ample opportunity to view the interesting displays of the Electrical Show.

Indicating Enclosed Fuse Litigation.

The U. S. Circuit Court of Appeals for Massachusetts has rendered an opinion reversing the lower court and sustaining a patent granted Aug. 1, 1903, to C. Thalacker, of Charlottenburg, Germany, on an enclosed fuse having an opening in the top portion of the case whereby the condition of an auxiliary indicating fuse may be noted. The main fuse is completely enclosed and surrounded by packing, but a portion of the auxiliary fuse is not enveloped. In its opinion the court discusses several of a number of patents cited by the defendants as anticipatory.

In an Edison patent, No. 264,659 (1882), notice of the blowing of the main fuse is given by a bell carried on an auxiliary conductor in shunt. The auxiliary conductor is not blown by the blowing of the main fuse, but the passage of the excessive current through the auxiliary conductor does no more than ring the bell. The court considers that the arrangement of the Edison patent is different from that of the Thalacker patent, and is ill-adapted to many places for which the patent in suit was intended. In the Edison device the auxiliary conductor is not a fuse. Its condition is not seen, as in Thalacker's first claim, but heard; it is not partly enveloped in the casing, as is stated explicitly in Thalacker's claims two and four, and by implication, in claim one, read in the light of the specifications. Its mode of operation is different.

In a patent to Van Depoele, No. 417,122 (1889), the combustion of the safety fuse ignites a small cord or other fragile support sustaining a semaphore. The destruction of the support releases the semaphore which drops out of the enclosing box. The court adds that the Van Depoele device contains no auxiliary fuse in the proper sense of the word, and its practical operation is open to numerous objections which do not lie against the patent in suit.

In a British patent to Mordey, No. 19,076 of 1890, the patentee sought principally to set out the advantages of packing a safety fuse in a porous substance which should take up some of the heat engendered by the fusing as well as the minute particles of molten metal. The patent in suit suggests, as old in the art, a non-conducting box or a packing of thin strips of non-conducting material. The court states that though Mordey's "finely divided or pulverized non-conducting material" may be preferable as a packing, the comparison is not in question in the suit. Again, Mordey states that "a small space is, or may be, left uncovered by this material at some portion of the tube or vessel to enable the position and condition of the fuse conductor to be observed." He here refers to an observation, not of the auxiliary, but of the main fuse, the need of which observation Thalacker sought to avoid. Still again, Mordey says, "For large currents I prefer to use a small fuse constructed as above described, or otherwise according to my invention, and to shunt it by an ordinary fuse, or by an electromagnetic or other cut-out. This ordinary fuse or cut-out is arranged to carry practically the whole current. In the event of an excessive current, the ordinary fuse melts or the cut-out acts, but does so with a scarcely perceptible spark. The final rupture of the circuit then occurs in the small special fuse." The court states that here Mordey's "ordinary fuse," which carries practically the whole current, is fully exposed, and the small packed and covered fuse does not serve as an indicator, but only to prevent the ordinary fuse from "arcing." This effect it produces by itself taking the final break in the current, and so relieving the ordinary fuse. As is said by Professor Cross, the complainant's expert: "If the current becomes excessive, the ordinary fuse melts or the cut-out acts, but with a scarcely perceptible spark, and the final rupture of the circuit then occurs in the small special fuse." This operation, the court concludes, has nothing to do with the patent in suit. Where the Mordey patent uncovers "a small portion of the fuse conductor," there is no auxiliary fuse, and where Mordey shows an auxiliary fuse the main fuse is quite uncovered and no indicator is needed or employed.

Of the elements in Thalacker's first claim, the court states that the main safety fuse and the box or packing which envelop it are old in the art. The gist of Thalacker's patent consists in the combination with these old elements of an auxiliary fuse whose condition is at all times conveniently observed, so that by reasonable inference the condition of the main fuse may be known. This combination appears novel and unanticipated by any of the patents cited. The invention goes beyond the mere details shown, and the patent should receive a construction correspondingly broad. As was said by the Circuit Court: "While these patents show that Thalacker was not the first to provide an enclosed fuse with an exterior conductor, they contain no suggestion of the use of the auxiliary fuse for indication." The defendant's device differs from that of the patent in suit only in the formation of its safety fuse. Instead of a small fuse, purely metallic, in shunt with the main

fuse, the defendant has employed a fine wire connecting the main safety fuse with a paste which conducts the current into the metal cap of the covering case and so returns it to the main line. When the main fuse is blown, the current passing through the highly resisting wire portion of the auxiliary fuse ignites a part of the paste and renders it a non-conductor. The condition of the auxiliary fuse is known, not by looking at the broken wire through a small hole in the covering as in the patent in suit, but by the discoloration of the paste shown through a similar hole. The court, however, considered these differences as immaterial.

Annual Reports of the New York Public Service Commissions.

Reports of the two Public Service Commissions of New York State for the year 1909 have been submitted to the Legislature.

REPORT OF SECOND DISTRICT COMMISSION.

Out of a total of 811 corporations, municipalities and individuals over which the Public Service Commission of the Second District has jurisdiction 292 are electrical corporations and plants and 139 are street railroad corporations.

The dividend experiences of the electrical corporations, electric railroad corporations and gas corporations of which the commission has supervision were as follows:

Total number of corporations, all classes	310
Total number paying no dividends	237
Total number paying dividends	73
Total number paying no dividends on common stock	243
Total number paying no dividends on preferred stock	16
Total number paying dividends on common stock	67
Total number paying dividends on preferred stock	15
Amount of common stock paying no dividend	$126,956,530
Amount of common stock paying dividend	53,859,074
Amount of preferred stock paying no dividend	15,317,400
Amount of preferred stock paying dividend	18,461,072

Discussing these facts, the commission says: "The very remarkable showing made by these tables and summaries demands but little comment from the commission at this time. Attention should, however, be directed to the fact that they have no wide range of use except by way of suggestion for investigation. The significance of the facts which they disclose depends wholly upon the further fact not disclosed whether these stocks represent actual cash investment in the properties of the several corporations or whether they are lacking in that particular characteristic.

"It is common belief that the plants of the public-service corporations included in these tables have been constructed, as a rule, upon bond issues, and that the common stock, at least, is representative only of hopes entertained. The precise truth with regard to so many corporations, many of which are the produce of reorganization, it is difficult, if not impossible, to ascertain. The intervention of construction companies to which a lump amount of stock and bonds has been issued for construction, makes a clear showing of what has been paid for with stock and what with bonds, or how much has been realized for the stock, impossible.

"The general fact is believed to be beyond dispute, although it may not be susceptible of legal proof in many cases, that in launching public-service corporations prior to the regulation of capitalization by the State, it has been thought that capital could not be enlisted without the aid of large bonuses in the form of stock upon which returns could be had either by way of dividends or by sale to those seeking an investment. It has been feared, unquestionably, that the regulation of capitalization by the State and insistence by the commission upon the law, that capital stock should be issued only for full par value in money, property or services, would hinder, if not prevent, the further growth of such corporations by making them unattractive as business enterprises. Upon this point certain observations seem pertinent.

"If the stock of non-dividend-paying corporations represents no actual investment of money, and was in its inception issued merely as a bonus or gratuity in connection with the promotion of the enterprises upon the expectation that it would yield profits and thus become of substantial value, the table demonstrates the fatuity of any such expectation.

If the stock was a bonus or gratuity to those to whom it was issued, but has been transferred to holders, for a valuable consideration, who made the purchase as an investment, the table is a warning against dealing in stocks issued for no value, representing no property and having no prospect of a return except from unreasonable charges.

"If the stock represents actual investment, then there is a grave reason to consider what is wrong in the condition of public-service corporations in this State that they cannot earn returns upon such enormous sums of money invested in them.

"Any system of law which permits uninstructed investors to place their money in stocks of public-service corporations which either ought not to, or cannot, yield any return, and which, in fact, are non-productive, is distinctly injurious to the non-investing as well as the investing public. Eventually capital will learn by experience the actual results of such financing and will carefully avoid enterprises thus handled.

"The value of the tables presented lies in their conclusive demonstration that, broadly speaking and taking the corporations included as a class, such corporations have either been financed by methods which the event has shown to be disastrous or they are now operating under conditions which need careful investigation."

Authority was granted by the commission during the last year for the issue of $142,855,035 of stocks, bonds and other evidences of indebtedness, making a total of $252,839,681.34 authorized during the 30 months of the commission's existence. Of the total authorized in the last year the following were for electrical corporations: Stocks, $1,991,500; bonds, $6,036,500. For gas and electrical corporations combined $2,528,600 bonds were authorized. Electric railroads were authorized to issue $4,154,000 stock and $4,950,360 bonds.

During the year the commission devoted 202 days to public hearings and heard 415 matters. Five hundred and thirty-two formal complaints and others which were treated informally numbering 1088 were received, a total of 1620 as against 1399 during 1908, a gain of 30 per cent. The number of applications from corporations for various authorizations was 225 as against 207 in 1908. During the year the commission disposed of 1515 of the matters. The commission says that its practice of taking up complaints for informal investigation and disposition whenever practicable serves: "First, to cause prompt settlement of cases by concession of relief to the complainants; second, to promptly advise many complainants that the law does not apply to the matters they present, either from lack of jurisdiction or because no violation of the statute is shown; third to keep down the number of cases requiring formal investigation and action down to a minimum.

"So far as rates and rate regulations are concerned, and in many cases as to service, the public is best served by this method of informal investigation. Where authority to effectively correct abuses is fully conferred by the statute, the changes of rates and provision of better service called for by well-founded complaints can generally be secured by the commission without trial and issuance of orders."

The report gives in detail the results of two special investigations, the first relating to the necessity for a heating power standard in measuring the value of gas; the second to the practice of electrical companies in requiring cash deposits from consumers.

As certain complaints had been made of alleged abuses existing in connection with the practice of gas and electrical corporations requiring cash deposits of consumers, an inquiry was made into this subject. The results showed that at present 129 corporations hold deposits in the aggregate amount of about $468,000 paid in by upward of 51,000 consumers, and that from time to time since about 1890, when the authority was first given the companies to require such security, deposits have been returned to consumers, either directly by refunding, or indirectly through credits, in an amount exceeding $1,000,000. The practice of the companies was found not to be uniform in

recording deposits when received, in allowing and paying interest, and finally informing the depositor of the terms and conditions upon which the deposit is exacted, held and may be withdrawn.

Electrical corporations have been required to make periodic tests of consumers' meters, using standards that are checked for accuracy by inspectors of the commission. Of 78,116 electrical meters tested 69,000 were found accurate within 4 per cent, 20 per cent were found 4 per cent or more slow, and 11 per cent were 4 per cent or more fast. In the commission's supervision of this work 174 electrical station standards were checked for accuracy.

The commission asks for "additional employees so that traveling auditors may be sent about through the State to assist the smaller corporations and municipalities operating public utilities who are required by law to report to the commission. The corporations, while rendering an important and usually highly appreciated service in their respective communities, are, because of the smallness of these communities, limited to extremely slender revenues, such that the cost of the services of skilled accountants seems one of the expenses most easily avoided and, therefore, least necessary to incur. Most of the municipal plants are particularly in need of such aid, and many of them have made requests for it.

REPORT OF FIRST DISTRICT COMMISSION.

The commission of the first district considered 271 formal cases in 1909, of which 57 were not determined at the end of the year. Only three applications relating to the issue of securities were made by gas and electrical corporations. The Kings County Lighting Company applied for authority to issue $450,000 bonds, and the commission allowed $200,000. Application involving $740,000 bonds was made by the Bronx Gas & Electric Company, and the commission allowed $625,000. The Kings County Electric Light & Power Company asked for authority to issue $5,000,000 bonds, and the case is still pending.

A large proportion of complaints coming to the commission is handled by informal correspondence. Complaints against gas and electric companies, other than complaints as to meters, number 318, in only one of which did the company appeal to the commission from an informal ruling. The total number of electric meters tested during the year was 925, of which all were complaint meters. The commission has prescribed detailed specifications for electric meters that may be used within the district, and has approved of a considerable number of types of meters as complying with the specifications. The companies, in addition, have been ordered to remove all electric meters not of a type approved by the commission.

The electric companies have been ordered to file schedules with the commission, showing the rates and charges made by them for service, and they are prohibited from making any changes except upon 30 days' notice to the commission. The companies are also prohibited from giving rates to consumers which may be discriminatory. Under these orders there is now for the first time publicity of the various rates charged for electricity. Of the schedules showing the rates and forms of contracts there must be kept on file in all offices copies to be given to consumers on request. The report contains a summary of rates charged by the various companies.

The recommendations made by the commission as to legislation are, in part, as follows:

"It seems to have been the intention of the law that the commission should be an administrative body with power to prescribe rates and facilities in accordance with a rule laid down for guidance in each case. The State courts have declared, however, contrary to the holding of the United States Supreme Court, that the words employed in the act make the commission a judicial or quasi-judicial body in respect to rates, and it would seem to follow in respect to service and facilities. The result is that orders of the commission which are contested do not go into effect at once, but can be kept in litigation for a long time, their efficacy thus being made to depend, not upon their correctness, but upon a written record of evidence.

"One of the main purposes of the law was supposed to be the prevention of stock watering. The courts have held, however, that the words used in the section relating to this subject only require the commission to determine whether stock and bonds sought to be issued come within one of the four purposes stated in the section, i.e., the acquisition of property, construction of its facilities, improvement and maintenance of its service, or the discharge or refunding of its obligations. The result is that this construction of the words used in the act deprives the commission of power to stop stock watering, for it is easy for the companies to bring within the four legal purposes sums that never should be capitalized, as, for instance, expenses of operation, taxes, replacements or even dividends.

"Although these decisions of the court have devitalized the public service commission law, they serve to indicate the changes which should be made by the Legislature to bring the law back to its original intention."

New York Public Service Commission News.

The annual reports of the two New York Public Service Commissions are given in abstract elsewhere.

Assemblyman Parker has introduced a bill into the New York Legislature amending generally the Public Service Commissions law. The law is in the same form as that drafted by the Public Service Commissions, and introduced by Assemblyman Phillips last year, with the amendments made by both the Assembly and Senate committees last year. The bill gives the commissions the power to require street-railroad corporations to establish through routes and joint rates of fare, allotting a portion of the joint fare to each corporation. It also gives the commission of the First District jurisdiction over the ferries, except those which are controlled municipally.

The Public Service Commission of the First District has had made a rough census of the population of the territory in Brooklyn and the Bronx for a half mile on either side of the proposed new subway routes. In the Bronx this population shows an increase from 143,647 in 1905 to 207,182 in 1909. About the same ratio of increase is shown along the Eastern Parkway and the Nostrand Avenue routes in Brooklyn.

The commission has made an order permitting the Bronx Gas & Electric Company to issue bonds to the amount of $643,000 bearing 5 per cent interest and payable in 50 years. These are to retire $500,000 worth of bonds outstanding and to pay for improvements.

A hearing has been ordered for Feb. 9 upon the application of the Manhattan Bridge Three-Cent Fare Line for a certificate to construct and operate a railway through Canal Street and across the new bridge to Atlantic Avenue in Brooklyn.

The Board of Estimate and Apportionment has adopted a resolution appointing Mayor Gaynor, Comptroller Prendergast and President Mitchel, of the Board of Aldermen, as a committee to consider and expedite rapid transit matters in the City of New York. It is the purpose of the board, as proposed by the members, to push the building of subways with all possible energy.

The joint legislative committee which before the holidays was investigating the telephone and telegraph situation in New York with a view to placing the companies under the supervision of the Public Service Commission, resumed its hearings in the City Hall on Jan. 19.

The Public Service Commission of the Second District will this week continue its hearings on the complaints of residents of the villages of White Plains, Port Chester and Westchester against the Westchester Lighting Company as to the quality and price of gas and electricity. A further hearing will also be given on the application of the Oriskany Hydroelectric Company for authority to issue common capital stock to the amount of $500,000 and a mortgage of $2,500,000, and the petition will be heard of the People's Gas & Electric Company, of Oswego, and the Citizens' Electric Light Company, of Oswego, for permission to merge the companies, leave to issue $150,000 common capital stock and for permission by the People's company to acquire all the capital stock of the Citizens' company, amounting to $53,200.

Massachusetts Legislative News.

The various special reports of the joint public-utility commissions of Massachusetts, referred to in the last issue of the *Electrical World,* are now under consideration by the Legislature, and the majority have been referred to appropriate committees for public hearings in the near future. The larger transportation matters in connection with the Boston district have been referred to the committee on metropolitan affairs, notably those referring to the proposed subways and tunnels. Specific recommendations of the joint board in regard to Boston Elevated Railway expansion, and the consolidation of that company with the West End Street Railway Company, have gone to the committee on street railways.

A number of new bills of interest to public-service corporations have been submitted to the House or Senate. One provides for the construction of a tunnel or subway through the West End district of Boston, connecting the Cambridge bridge with Park Street by way of Bowdoin and Scollay Squares, the object being to widen out the terminal of the subway now under construction between Park Street, Boston, and Harvard Square, Cambridge, and to afford a closer connection between the Cambridge suburban district and the Scollay Square and West End area, than the present subway plan offers.

A bill has been introduced as a result of a petition by John H. Carter, requiring the public-service commissions to appear at all hearings affecting corporations under their jurisdiction, to state their opinion of the effect of proposed bills upon the public welfare. Such a measure, it is feared, however, would go far to render impossible the continuous application of the commissions to regular duties. Under the present law the commissions are subject to the orders of the Legislature for appearance or recommendations in specific cases, and are frequently called upon during sessions of committees to supply information.

A bill has been introduced to reduce the hours of work of street-railway employees one hour per day, compared with the maximum now permitted by law. Another bill provides for the construction of a tunnel or subway between the North and South Stations in Boston by the Boston & Maine and the New Haven railroads. Other pending legislation will permit the construction of a joint steam and electric railroad station at Castle Street on the Washington Street tunnel line of the Boston Elevated Railway Company.

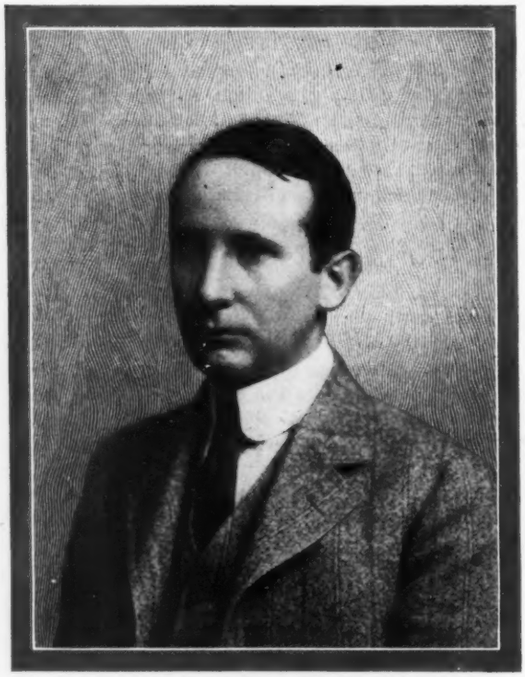
Practically nothing of general interest has thus far been proposed regarding electric lighting, power or gas companies. The usual appropriation bills have been introduced for the Worcester Polytechnic Institute and the Massachusetts Institute of Technology, the allowance in the case of the latter institution representing an annual appropriation of $20,000.

AMERICAN ELECTRICAL ENGINEERS—II.

Frank R. Ford.

Frank Richards Ford was born in Philadelphia in 1871 and received his primary education in the public schools of that city. Entering the University of Pennsylvania in 1886, he was graduated from its mechanical engineering course four years later with the degree of B. S., and received the post-graduate degree of M. E. the following year.

For the first two years after graduation Mr. Ford was connected with several electrical manufacturing concerns, including the Short Electric Railway Company, of Cleveland, and in 1894 with Mr. George W. Bacon formed the engineering firm of Ford & Bacon, which, shortly after, upon the admission of Mr. George H. Davis, assumed the present name of Ford, Bacon & Davis. From its beginning important engineering work was confided to this firm, much of which at the earlier period was, in whole or in part, personally executed or supervised by Mr. Ford. Among the first work was the engineering design and supervision of the reconstruction of the electric railway property of the Orleans Railroad Company, New Orleans, La., and the equipment of the large plant of the American Lithographic Company, in New York City, with electric motors, this being not only one of the largest and most varied motor installations up to that period, but the pioneer development of the direct motor drive for lithographic presses and machinery. Among work from 1899 to 1902 was the design and supervision of the reconstruction and extension of the lines of the Philadelphia & West Chester Traction Company and similar engineering work for the Georgia Electric Light Company, Atlanta, Ga.; the Atlanta Rapid Transit Company and the Elmira Water, Light & Railroad Company, of Elmira, N. Y., of which latter company Mr. Ford had been made president. In addition to the above work, to which he largely gave personal attention, Mr. Ford has assisted in the general supervision of the engineering work of his firm, which has comprised to the present time the reconstruction and extension of the street railway systems of New Orleans, Washington, Kansas City, Birmingham, Nashville, Little Rock, Knoxville, Memphis, San Francisco, New York City, Brooklyn and other cities; and the reconstruction of the electric light plants of many of these and other cities. The firm



Mr. Frank R. Ford.

has also acted for many of these systems as experts in supervision of operation.

From 1895 to date Mr. Ford has been actively connected with the development of the New Jersey & Hudson River Railway & Ferry Company, of Edgewater, N. J., and since 1900, when the property passed under the control of Ford, Bacon & Davis, he has had direct charge of its engineering and operating details.

This property is widely recognized as a model suburban electric railway system, not only with respect to construction, operation and financial returns, but in giving satisfaction to the public and securing its good will to a remarkable degree. In construction and operation it typifies the principles to which Mr. Ford and his firm have always adhered, namely, to identify themselves only with such properties as will admit of thorough and substantial construction and equipment, and then in development to proceed along the most approved lines, in order to give the best possible service to the public, and at the same time secure a fair return for the enterprise.

During the past five years Mr. Ford has been engaged on a number of special street-railway problems of much general in-

terest. During 1905-1906 he represented his firm as expert adviser of the Chicago City Railway Company in arriving at a franchise settlement, and suggested the policy as to the division of profits with the city and the control of technical details of construction and operation by a board of supervising engineers instead of by politicians and lawyers. With the assistance of his engineering organization, in 1905 Mr. Ford developed a comprehensive plan for ascertaining the average length of ride and average receipts per passenger-mile, or, in other words, the number of passenger-miles operated over various divisions of a street-railway system. He used this plan in order to ascertain the earning power of the various franchises of the Chicago City Railway Company, and his firm has employed it in a number of other cities. In several instances it has been applied with notable success in determinations which otherwise would have involved considerable difficulty, among others to the investigation as to the proper rate of fare from New York to Coney Island on the lines of the Coney Island & Brooklyn Railroad Company, which showed that a 5-cent fare from Brooklyn to Coney Island was unreasonable; and in the case of the Metropolitan Street Railway Company, where it was suggested by Mr. Ford as the basis upon which to separate the earning power of the constituent properties.

In connection with the work of his firm as consulting engineers for the receivers of the Metropolitan Street Railway Company, Mr. Ford developed a standard type of double-truck car which has largely revolutionized the design of rolling stock for electric railways, and, either in its original or modified form, is being introduced in many cities.

Mr. Ford has done a great deal of pioneer work in the development of forms of reports and statistical forms for street-railway and lighting properties according to a system whereby not only the exact present condition of a property may be determined, but plans enabled to be intelligently laid down for the future. He has also assisted in the development of standard forms of accounts for street-railway and electric light companies. For the past two years Mr. Ford has given much attention to broad engineering and financial matters dealt with by public bodies, such as the Interstate Commerce Commission and the Public Service Commissions of New York State. In connection with the fare case of the Coney Island & Brooklyn Railroad Company he developed a new method of valuation of public-service properties differing materially from former valuations, such as those made in Chicago, Cleveland and Detroit, and for the first time applied to a street-railway property not only methods of valuation recognized as correct in other industries, but also a new theory of valuation based upon present cost of reproduction, which is particularly applicable to rate cases.

Mr. Ford has contributed a number of articles to technical journals, principally on street-railway subjects. One of these on "Traffic Conditions of New York City," which appeared in 1901, has been used in subsequent investigations of this subject. He is a member of the American Institute of Electrical Engineers, the American Street and Interurban Railway Association, the Engineers Club and the Railroad Club. In 1896-1897 he represented the American Street Railway Association at the National Conference on Standard Electrical Rules, which formulated the original National Electrical Code, and since 1907 has been a member of the American Street and Interurban Railway Association's committee on Interstate Commerce Commission affairs. He is a director of a number of public-service corporations.

CURRENT NEWS AND NOTES.

Proposed New Jersey Public Utility Commission.—In his annual message to the New Jersey Legislature, Gov. J. F. Fort declared that the Legislature would stulify itself if it did not pass a bill providing for a public utilities commission, as was promised two years ago, and again at the last election.

Electric Baking Contest.—Among the special features of the electrical show to be held in Toledo from Jan. 31 to Feb. 5 will be a baking contest between the demonstrators representing the various manufacturers of heating devices.

Electric Light in 700,000 Residences.—It is estimated that the electric light is used by 700,000 American families, out of a total of about 8,500,000 families living in cities, towns and villages. Less than 10 per cent of families use the electric light in communities where it is available. Statistics in detail on the above subjects will appear later in these columns.

Statistics of American Cities.—A census bulletin just issued gives statistics, under date of 1907, relating to the income, debt and administrative expenses of American cities having a population of 30,000 or over. In 1907 there were 15 cities having a population of 300,000 or over, 29 cities having a population between 100,000 and 300,000, 47 cities having a population between 50,000 and 100,000, and 67 cities having a population between 30,000 and 50,000. The total number of cities having 30,000 or more population is thus 158.

Regulation of Water Rights.—In his annual report to the New York Legislature State Engineer and Surveyor Frank M. Williams recommends legislative provision for instituting a broad investigation of rights along about 1800 miles of the streams of the State. The investigation will relate particularly to possible water supplies and water-power developments. He also recommends an amendment to the law which prohibits the State from disposing of any water-power created by large canal construction.

The Gyroscope.—At the lecture to be delivered by Prof. W. S. Franklin before the New York Electrical Society on the subject, "The Practical Application of the Gyrostat," a working model of the Brennan monorail car will be exhibited. Messrs. Richard Scherl and Paul Froelich will describe the Scherl monorail car now being exhibited in this country. Mr. E. A. Sperry will discuss the possibilities in the utilization of the gyrostat in aeronautics. The meeting will be held in the Engineering Societies Building, New York, at 8 p. m., on Jan. 27, 1910.

Compulsory Wireless.—It seems probable that a bill will be enacted at this session of Congress requiring the installation of wireless telephone or telegraph apparatus on vessels carrying more than 50 passengers. Such a bill, drawn by Senator Frye, of Maine, provides: "That it shall be unlawful for any ocean-going steamer certified to carry, or carrying, 50 passengers or more, to carry passengers between ports 200 miles or more apart by sea unless on leaving her port of departure such steamer shall be equipped with an efficient apparatus for radio-communication in good working order and in charge of a person skilled in the use of such apparatus."

Wireless in the U. S. Army.—In a report submitted by the chief signal officer of the United States army to the Secretary of War, it is stated that there are now in the army service a total of 39 wireless telegraph stations, of which 13 are in the United States, 9 in Alaska, 5 in the Philippine Islands, 5 on artillery harbor tugs and 7 in army transport service. The signal core has purchased a 2-kw, 100,000-cycle alternator for wireless telephone service. The advisability of the United States taking part in the international wireless telegraph treaty is recommended for the consideration of the United States Senate. Wireless telephone equipments are now being installed at the Bureau of Standards and at the quarters of the Signal Corps of the army, on Pennsylvania Avenue, Washington, to conduct experiments looking toward the selection of the best devices for army service.

Minnesota Electrical Association.—The 1910 convention of the Minnesota Electrical Association will be held March 29, 30 and 31, at Minneapolis, Minn. Mr. H. J. Gille, of the Minneapolis General Electric Company, is president and Mr. B. W. Cowperthwait, of Faribault, is secretary and treasurer.

A. I. E. E. Annual Dinner.—The annual dinner of the American Institute of Electrical Engineers for 1910 will be held at the Hotel Astor, New York, on Thursday evening, Feb. 24, 1910. Prof. Elihu Thomson, who has been awarded the first Edison Medal, will be the guest of honor on that occasion.

Conservation in Canada.—During the present week, from Jan. 18 to 21, the first annual meeting of the (Canadian) Commission of Conservation is being held at Ottawa. One of the most important features of the meeting is the agitation of the hydroelectric power project of the Provincial Government of Ontario, concerning which Mr. Adam Beck will deliver an address.

Underground Wires Proposed for Jamestown, N. Y.—The Park Commission of Jamestown, N. Y., is interesting itself in the feasibility of installing a conduit system in that city, so that all electric wires except trolley wires may be placed underground. A committee has been appointed to investigate the question. Mr. Robert K. Beach, secretary pro tem of the commission, is a member of the committee.

Prosperity in Steel.—To the extent that the activity in the steel industry shows the general condition of the business of the country, the indications point to much immediate prosperity. It is estimated that about $55,000,000 will be spent for new plant construction during 1910, as compared with $45,000,000 during 1909. With the exception of $66,000,000 spent during 1907, the amount for 1910 will be the largest in the history of the corporation.

Deep-Waterway Bill Passes Illinois Senate.—By a vote of 28 to 16 the Senate of the Illinois Legislature has passed what is known as the Schmitt waterway bill, which is favored by Governor Deneen and which provides for the issuing of $20,000,000 in bonds to construct a deep waterway from Lockport to Utica, Ill., connecting the Chicago Drainage Canal, and therefore Lake Michigan, with the Illinois River at Utica. If this waterway is built, it will be possible to utilize considerable water-power, which the State proposes to do.

Telephone Investigation.—The Pennsylvania State Railroad Commission has directed its attorney, Mr. William H. Allen, to take charge of the investigation of the telephone companies operating in Pennsylvania. The commission is required to report to the next Legislature such recommendations as it may deem proper for the suppression of discriminations and excessive charges, if any are found in the contemplated investigation. The telephone companies will be asked to open their books to the probers. It is probable that the commission will name several experts to carry on the work.

Kirchhoff Luncheon.—More than 200 of his professional friends gathered at the Engineers Club on Jan. 16 to do honor to Mr. Charles Kirchhoff, who recently retired from the editorship of the *Iron Age* prior to his sailing on a West Indian cruise. The speakers included Messrs. Philip T. Dodge, T. C. Martin, John Fritz and W. C. Cope, Dr. Rossiter W. Raymond and Dr. Henry S. Drinker, all of whom commented upon the high esteem in which Mr. Kirchhoff is held by those who know him. The guest of honor was presented with a bronze statuette, representing an industrial engineer, as a memento of the occasion.

Pubilc Utilities of Moscow.—According to a consular report, at present the municipal street railway system, which has 40 miles of track, employs over 300 motor cars and 400 trailers, besides 600 old horse cars reconstructed as trailers. The fare is 2½ cents for about 1½ miles; 4 cents for 2½ miles, and 5 or 7 cents for longer distances. The city generates electricity for the street railway system, lighting some of the streets and for other municipal purposes. Commercial and residence service is supplied from a central station owned by a French company, the rate being from 17 to 18 cents per kw-hour. The consular report makes the surprising statement, which is probably in error, that out of the total spent in Russia for lighting in 1906, 39.6 per cent was for the electric light, the figures for kerosene and gas being 54.6 and 5.8, respectively.

Chicago Branch of N. E. L. A.—At the next meeting of the Commonwealth Edison branch of the National Electric Light Association, Chicago, to be held at the rooms of the Western Society of Engineers, on Jan. 25, two original papers will be read. One will be by Mr. H. E. Addenbrooke, assistant auditor of the Commonwealth Edison Company, on "Accounting," and the other by Mr. B. G. Jamieson, of the engineering department of the same company, on a technical subject. It is planned to have monthly meetings of the branch during the year, except in July and August. At each meeting an effort will be made to present two papers, one on some technical subject and the other relating to the commercial side of the electric service business. Mr. John C. Manley is president of the branch.

Canadian Peat Fuel-Testing Plant.—The Canadian Mines Department is building at Ottawa a fuel-testing and gas producer plant which will cost when completed, exclusive of machinery, $15,000. The machinery is now being installed by an expert from the Koerting Company, of Hanover, Germany, and will consist of a Koerting double-zone peat gas producer, with its gas cleaning appliances and tar extractor, and a 50-hp. Koerting 4-cycle gas engine directly coupled to a Westinghouse direct-current generator. A water rheostat will absorb the electric energy generated when making a test. At the bog at Alfred the plant consists of an Anrep peating machine, portable tracks, conveyors, and cars, a large peat shed capable of holding 300 tons of air dried peat, a blacksmith shop and office. The raw peat from the bog containing 80 per cent of moisture is passed through a machine where it is more or less thoroughly mixed, kneaded and pulped and leaves the machine as a continuous bar which is cut into suitable lengths. These pieces are then stacked in the open, or until the moisture has been reduced to from 25 to 30 per cent. In this condition the peat is ready to be utilized for gas producing or domestic purposes.

Western Society of Engineers.—In his address as retiring president of the Western Society of Engineers at the annual meeting in Chicago on Jan. 12, Mr. Andrews Allen stated that the total membership of the society was 1085. Thirty-five meetings were held during the year 1909, of which 9 were those of the electrical section with an average attendance of 162, the highest average of any of the section meetings. "The electrical section," said Mr. Allen, "has had a season of unexampled prosperity, owing partially to the fact that it has been holding meetings with the local section of the American Institute of Electrical Engineers." A "bridge and structural section" of the society has been organized with a membership of about 190. The Chanute medals for 1908 were awarded to Messrs. Horace E. Horton, A. N. Talbot and Morgan Brooks. Mr. John W. Alvord, the new president, made an address in which he suggested, among other things, a section of the society to be made up of civil engineers engaged in working out municipal problems. The new officers of the society are as follows: President, Mr. J. W. Alvord; first vice-president, Mr. O. P. Chamberlain; second vice-president, Mr. A. Bement; third vice-president, Mr. W. K. Hatt; treasurer, Mr. A. Reichmann; trustees, Messrs. L. E. Ritter, G. M. Brill and W. W. Curtiss. Mr. J. H. Warder is the permanent secretary of the society.

JUNIATA WATER & WATER-POWER COMPANY.

Combination Hydroelectric and Steam Generating Station at Warrior Ridge, Pa., with the Transmission System.

THE plant of the Juniata Water & Water-Power Company is situated on the Juniata River at Warrior Ridge, Pa., five miles west of the city of Huntingdon. Passing in close proximity to the station is the main line of the Pennsylvania Railroad over which all the fuel used for generating steam is brought. The territory served extends from Altoona on the west to Lewistown on the east, the transmission lines following the main line of the railroad and the Juniata River throughout. In this section of Pennsylvania the main industries are stone quarrying and paper and pulp manufacturing, together with the vast enterprises connected with the Pennsylvania Railroad. Much of the firebrick, limestone and building brick of the State are produced here, as is also the white sand utilized for glass making. The cities and towns along the western end of the Juniata company's lines are largely inhabited by the employees of the Pennsylvania Railroad, which has shops at Altoona and Tyrone, the Altoona shops being the largest of the Pennsylvania system. At Lewistown, the eastern terminal of the line, are large steel works and rolling mills and one of the most modern silk weaving mills in the world.

The generating station is equipped with machinery having an aggregate rating of 3000 kw divided as follows: Four 500-kw, 2300-volt, three-phase General Electric alternators direct-connected to S. Morgan Smith waterwheels and two 500-kw General Electric steam turbine units of the same characteristics. The waterwheels operate under an available head of 27 ft. and are guaranteed to develop normal load at 94 per cent efficiency. Each is equipped with a Lombard governor and has an overload capacity of 50 per cent.

The ordinary maximum flow of the river is capable of giving a development of some 6000 kw; but in summer this flow is considerably reduced and during low-water period the steam auxiliary is used and advantage taken of what would not ordinarily be considered in a combination of this kind—that is, the water is stored at off-periods and the steam plant run at full load at all times. By this means an excellent load factor is obtained, so that the average coal consumption does not exceed about 3 lb. per kw-hour. The stored water is used on peaks, acting in this respect somewhat like a storage battery, and the dam across the river backs up the water for about four miles, thereby forming a good reservoir for storage purposes.

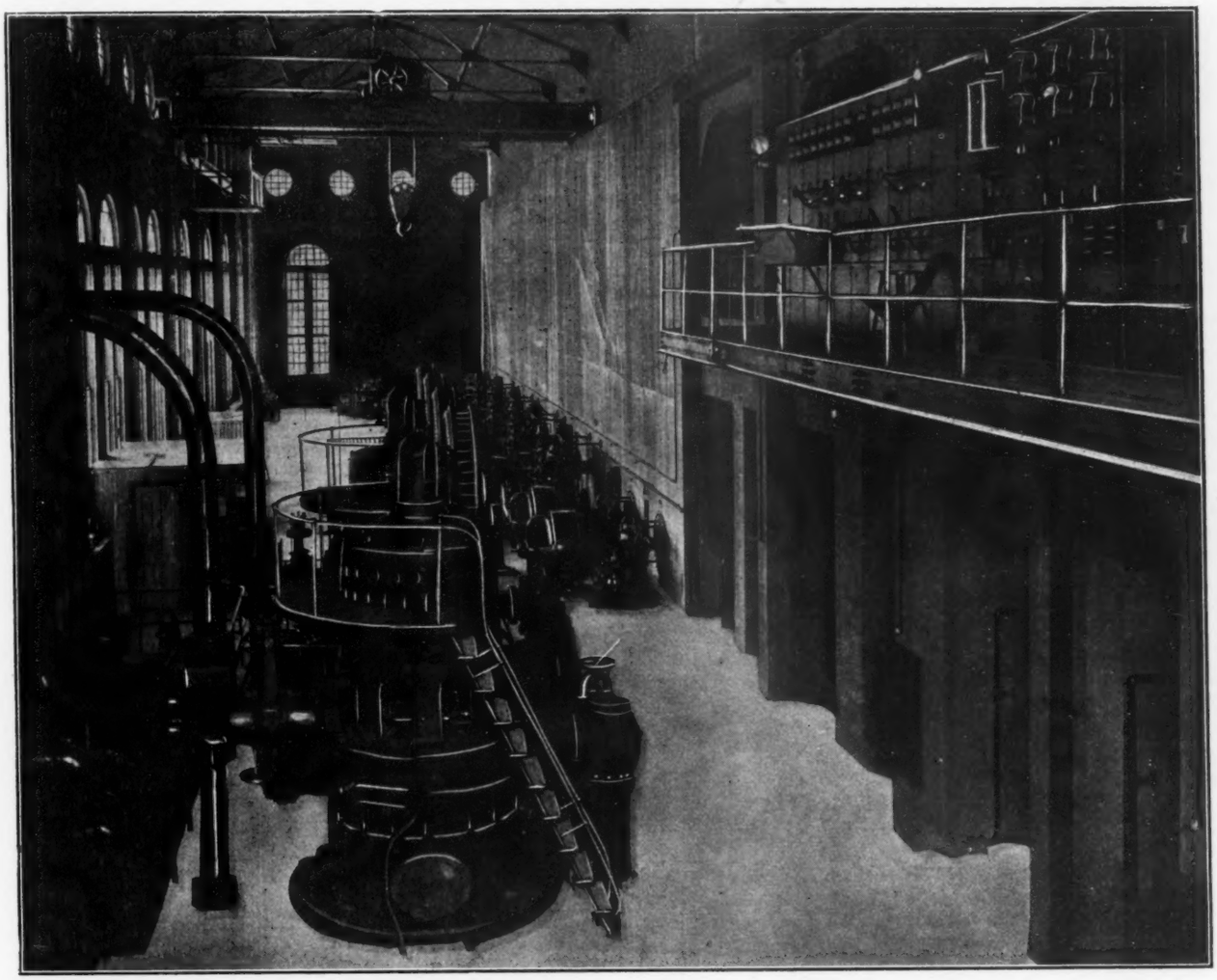


Fig. 1—Interior View of Juniata Water & Water-Power Company's Station.

The dam is of the hollow reinforced type, with the power house at the north end. All of the steam and the electrical generating equipment, including transformers, are located on the main floor of the station. Flumes for eight wheels are provided, six for main units and two for exciters. The steam equipment is housed in the opposite end of the structure from the hydraulic equipment, the boilers being located in a wing, as shown in the exterior views. To the east of the boiler house are eight pockets, over the tops of which a trestle runs from the Pennsylvania Railroad. These pockets hold about 5000 tons of fuel, which is within easy shoveling distance of the

boilers. The coal is delivered to the boiler-room floor through doors with hinged gates.

Provision has been made for four boilers, a battery on each side of the stack; but only one battery rated at 750 hp is at present installed. These boilers are of the Atlas water-tube

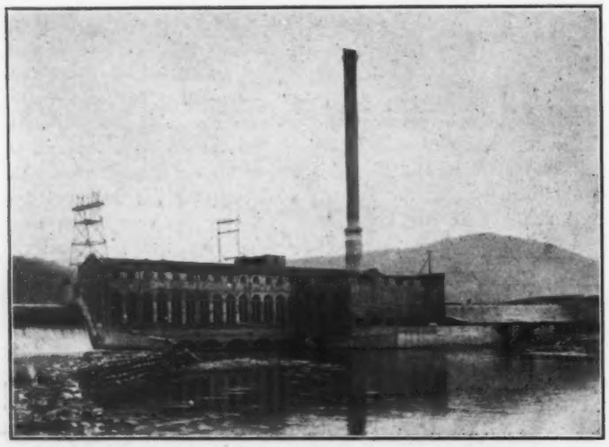


Fig. 2—Tail Race and Dam No. 1.

type and the furnaces are fitted with Quinn shaking grates. The coal used is brought from the mines in the Broadtop and Clearfield districts near by and while high in heat value possesses considerable sulphur and slate. It analyzes about 73.15 per cent fixed carbon, 22.09 per cent volatile matter, 4.17 per cent ash and 0.59 per cent sulphur. A sluiceway passes through the ash pit and the ashes and clinker may be flushed through this into a perforated hopper with a dump bottom on the tail-race side of the boiler wing. The finer material falls into the race, while the clinkers are caught and removed by other means. The stack is of concrete with an inside diameter of 7 ft. and a height of 175 ft. above the boiler-room floor.

The steam-turbine equipment is shown in the foreground of Fig. 1. Provision has been made for four units and the two at present installed are of the two-stage type operating at a pressure of 150 lb. The units exhaust into counter-current type surface condensers of the Worthington type. The condensers are mounted on a level with the turbine units, while the auxiliaries are on the floor below. No circulating pumps are employed in connection with the condensers, as the water is taken direct from the head water. Motor-driven centrifugal pumps are employed to deliver the water from the condenser hot wells to an open feed-water heater, whence it is pumped to the boilers. The condensing equipment is so arranged that any of the auxiliaries can operate with either condenser or in case of emergency one set can handle both condensers at reduced efficiency.

The main generators are all rated at 500 kw, 2300 volts, three-phase, 60 cycles, and are star connected. The exciter units are rated at 50 kw and either is large enough to meet the demands of all the main units. Arrangements have been made so that if advisable one of the exciters can be driven by an induction motor and the waterwheel disconnected.

The switchboard is made up of 20 panels, mounted on a platform overlooking all the steam and hydraulic equipment. The station output is metered on the low-tension side and each feeder panel is equipped with a curve-drawing meter. A Tirrill regulator is installed on the station panel to control the line voltage.

Bare copper wire is employed for the high-tension buses and these are separated by concrete barriers. Three sets of buses are provided, one for 2300 volts, one for 11,000 volts and one for 45,000 volts, and all are equipped with sectional oil switches. The outgoing feeders are divided between two sections so that the station output may be transferred from one set of feeders to another. The low-tension switches are operated manually; the 11,000-volt switches are solenoid operated, while the 45,000-volt switches are motor-operated. Both the 11,000-volt and 45,000-volt switches are provided with time-limit relays and the oil switches are placed in concrete compartments back of the switchboard and on the same elevation. The outgoing lines are protected by multi-gap arresters.

The generator voltage is stepped up to 11,000 volts and 45,000 volts by two banks of water-cooled, oil-insulated transformers; each bank being made up of three 500-kw units. The transformers are placed in separate compartments fitted in front with steel blinds and an extra unit is placed between the two banks as a reserve. Water for cooling purposes is taken from the head water through pipes and discharged under the tail water after passing through the cooling coils.

Substations at present connected to the system are located at Altoona, Tyrone, Mount Union, McVeytown, Lewistown and Huntingdon. At Altoona there is a capacity of 2000 kw, which with the growing demand will soon be insufficient. Here the voltage is stepped down from 45,000 to 6600 and taken thence to the old power station of the Citizens' Electric Company, where it is further reduced to 2300 volts for local distribution. At Tyrone the load is 225 kw and the voltage is stepped down at once from 45,000 volts to 2300 volts. The transformers in both of these stations are of the water-cooled type, water being supplied from near-by streams by gravity. The new line which has just been placed in commission between Huntingdon and Lewistown is equipped with transformers of the oil-cooled type and the voltage is reduced to 3300. The lightning arresters on this end of the line are of the aluminum type.

The transmission line from the main station to Altoona is of steel tower construction and the circuits are run in duplicate throughout, a ground wire being placed over the most hazardous points as a protection against lightning. This line is 30 miles long and the transmission towers are placed about 500 ft. apart and carry in addition to the six No. 2 seven-strand copper cables, a telephone line connecting the substations and offices along the line, besides various boxes having connections to be used by the patrolmen or construction gang when repairing the line. The insulators are of the triple petticoat type. The towers are made of steel angles heavily galvanized with footings set 6 ft. in the ground. The cables are supported at from 40 ft. to 46 ft. above ground, each set of conductors forming a triangle with 6-ft. sides and a bent channel at the top forms a sort of horn arrester with the line wire. Each tower is in addition grounded by a metal plate besides the grounding afforded by the footings. Air-break switches are placed at various points along the line so that in case of trouble the portion of the line affected may be cut out. As showing the excellent con-

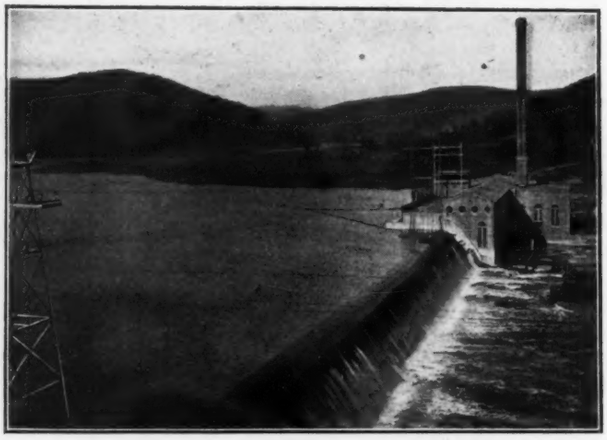


Fig. 3—View of Power House from Across Dam.

struction of this line, it is stated that the circuit has only been interrupted once in the last two years, this interruption being caused by a direct stroke of lightning during the past summer.

The two outgoing 45,000-volt and the three 11,000-volt lines are carried from an outgoing tower at the south end of the

electrical room, directly over the wheel pits. A terminal tower anchored into the concrete of the wheel compartments supports the wires at a height of about 50 ft. and bears the strain of a 400 ft. span used in carrying the wires across the river to a smaller tower at the opposite end. The lines divide here, two

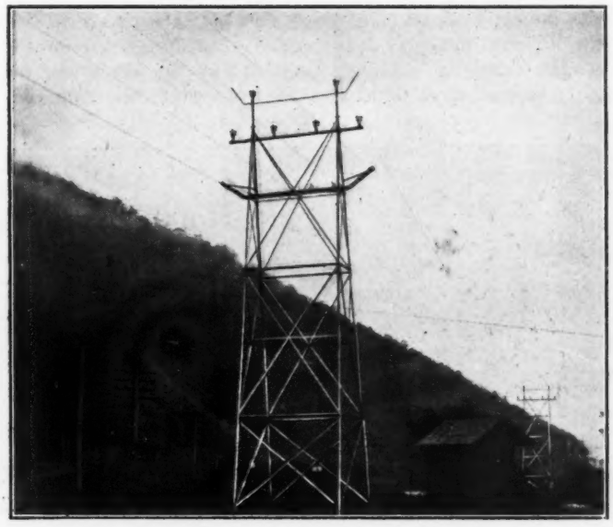


Fig. 4—Switchboard Gallery, Warrior Ridge, Pa.

11,000-volt lines running east to Huntingdon on a single wooden pole line and the other 11,000-volt line is carried on the towers with the two 45,000-volt lines running to Altoona for supplying local industries in that direction.

While the impression gained by passing through the country on the Pennsylvania Railroad would be that the lines cross a very mountainous district, the reverse is the case, as a short distance back from the river the country is rolling and not nearly so rough as it is nearer the Juniata. The only bad feature of the line is that it does not parallel the public highway and has, therefore, to be patrolled in many places on foot. Other than the ground wire mentioned, no lightning protection has been provided for the line excepting at the station and substations.

During the last year the company has extended the trans-

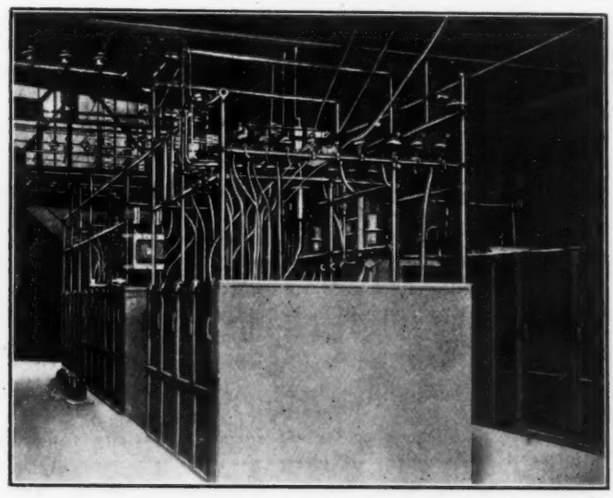


Fig. 5—View of Automatic Switches, High-Tension Line.

mission line from Huntingdon to Lewistown, and while the tower line has been very satisfactory, the new line is run on poles with an average spacing of about 125 ft. An angle arm is mounted on the top of these poles and extends a distance of 4 ft. above the top insulator. On this is carried a ground wire which extends from the plant to Lewistown. The pole line is cheaper to construct and quite as good as the tower line except as for life. The new line has only recently been put in commission and already there is about 400 hp contracted for along the route, while 1000 hp additional will probably be con-

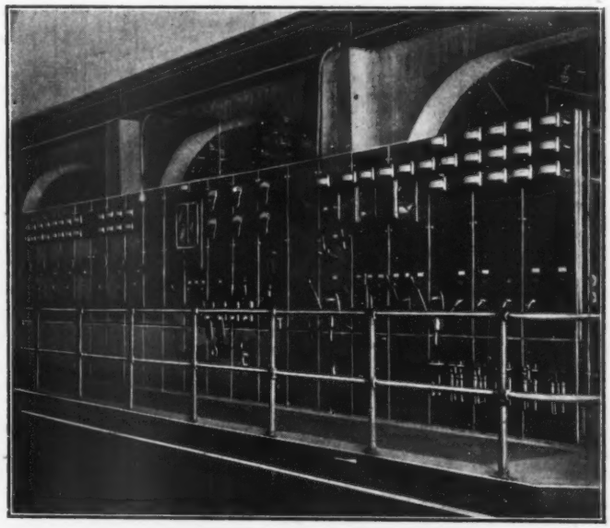


Fig. 6—View Along Transmission Line.

nected from the quarries and sand works along the line. This load will consist principally of motor-driven conveyors, pumps and blowers. A part of the load will be in rolling mills where the demands are high and the load factor comparatively low;

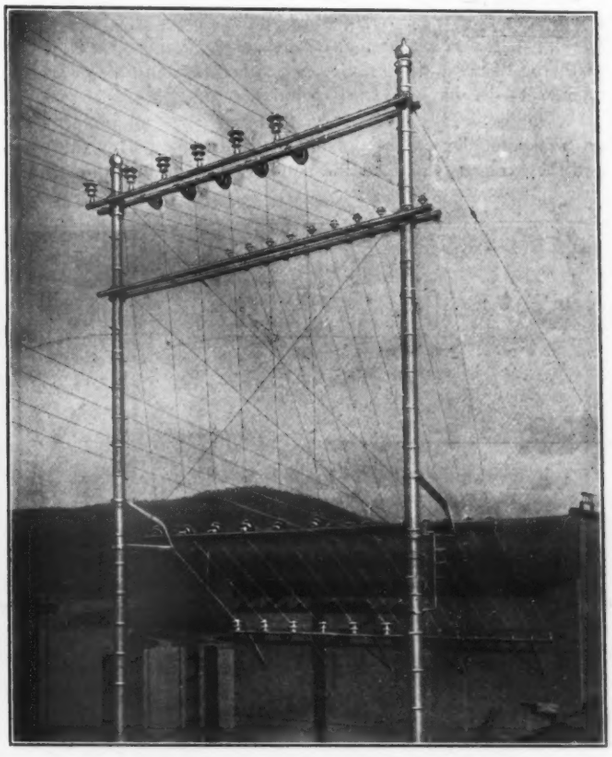


Fig. 7—45,000-Volt Lines Leaving Station.

but this feature is offset by the fact that the motors are used 24 hours. The Juniata Water & Water-Power Company is managed by Messrs. Dodge & Day, of Philadelphia, and Mr. E. T. Penrose, of Tyrone, is the superintendent of the entire system.

ELECTRICITY IN A COUNTRY HOUSE.

A 205-hp Oil-Engine Generating Equipment for the Supply of Electric Light, Power and Heat.

ONE of the large country houses in the neighborhood of Chicago is that of Mr. J. Ogden Armour near Melody, Ill., about 30 miles north of Chicago. Here Mr. Armour has an estate of about 1000 acres and has built a large and handsomely appointed house. The house and grounds are part of a carefully devised plan worked out by Mr. Arthur Heun, the architect, and it will be several years before all the improvements contemplated on the extensive estate are completed. Electricity is employed for lighting and the operation of motors, and to some extent for heating devices, and a power plant has been built on the grounds at an expense of about $40,000, it is said. This plant is now practically completed, and a brief description of it forms the subject of the present article.

Located 2900 ft. from the house, the power plant is housed in its own fireproof building, designed to correspond with the other architectural features. The main generating equipment consists of three Mietz & Weiss vertical engines operating on kerosene oil, which is delivered to an underground storage tank in wagon-load lots. There are two 90-hp, four-cylinder engines direct-connected to 60-kw Sprague 250-volt, direct-current generators and one 25-hp, three-cylinder engine direct-connected to a 15-kw Sprague generator. These units are shown in Fig. 1, the smallest of the three being the one at the right in the picture, while a booster set used for battery charging is prominent in the foreground.

The engines are two-cycle and ignite by compression in conjunction with a hot igniter ball which is kept warm in operation by the successively burned charges. They differ radically from other gas engines in that no circulation of jacket water is attempted; the water surrounding the cylinders goes into steam, which is injected with the charge, thus maintaining jacket water at the best temperature for efficient operation and also securing an increased economy in the cylinder.

Incoming air for combustion is drawn through piping from an intake muffler on the outside of the building near the eaves and the exhaust is muffled and condensed by an ingenious equipment especially devised for the purpose by Mr. Lucien I. Yeomans, who, while superintendent of motive power for Armour & Company, designed the power plant. By the operation of this device, the exhaust is muffled and condensed to such an extent that it is not noticeable a short distance away from the building. In the separate exhaust pipe from each cylinder a spray of water is introduced about 3 ft. above the engine-room floor. The exhaust lines from each engine enter a common header which terminates in a standard muffler provided normally with a 12-in. atmospheric exhaust. This muffler, instead of being allowed to deliver directly to the atmosphere, feeds into a second muffler through increasing sizes of connections to an 18-in. intake. The second muffler is oblong and contains two baffle plates with staggered holes which divide it into two compartments, and from the second compartment a 20-in. stack allows all non-condensable gases to escape. In the terminal exhaust pipe are six Hodgart mine sprays inverted, which serve to precipitate any finely divided particles of unburned oil already condensed by the previous spray and by the expansion, the latter having served to decrease the temperature below the condensation point of the oil. In actual use this apparatus delivers the exhaust from the second muffler at about 90 deg. Fahr. A two-stage centrifugal pump, driven by a direct-connected Roth motor, delivers water to the several sprays from a suction entering the first muffler pit. The system is effectively drained, and the same spray water is used again and again.

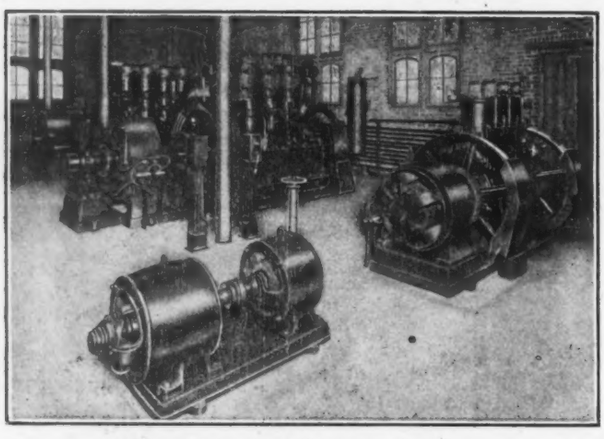


Fig. 1—Oil-Engine Generating Units.

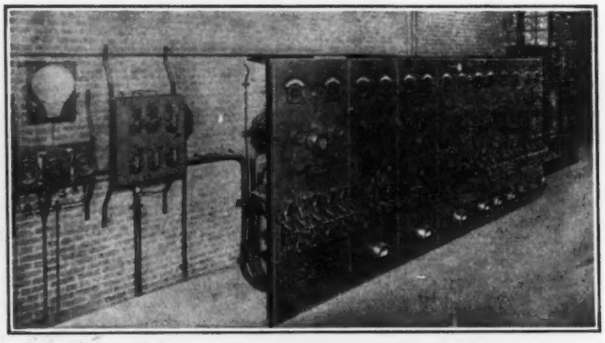


Fig. 2—Switchboard Motor-Starter for Pump on Wall.

The fuel consumption of the engines averages about 1 gal. of oil for 6 kw-hours on the switchboard. All oil, whether cylinder, lubricating or fuel oil, is handled by a Tokheim installation. The plant includes a storage battery, and in order to keep the battery-room at the proper temperature and to heat the plant, a hot-water heating system is installed.

The plant is direct current throughout, and is operated on the 250-volt, three-wire system. The handsome switchboard (Fig. 2), which is 18 ft. long, is of Monson slate. It was built by the J. Lang Electric Company and consists of seven panels. Three of these are generator panels, three are circuit panels and one, the left-hand panel, as shown in the illustration, controls the storage battery. This battery panel, besides the necessary voltmeter and ammeter, carries a 19-point end-cell switch, as well as the control for the booster and a Sangamo amp-hour meter. All the indicating instruments on the board are of the flush, illuminated-dial type, and Sangamo wattmeters are connected on each circuit. There are no switches other than small instrument switches on the whole board, circuit-breakers alone being used.

The storage battery, made by the Gould Storage Battery Company, is enclosed in a separate room with brick walls and contains 142 cells. Each element consists of 13 plates 10½ x 10½ in. suspended in glass tanks and the rating of the battery, as a whole, is 60 amp for eight hours or 240 amp for one hour. The booster set is wound to deliver 85 amp at 125 volts, the generator being driven by a 250-volt, direct-connected motor.

Not only does the power plant furnish electricity for the premises, but by means of electrically driven pumps in the station it supplies water for the entire establishment. The water-works equipment consists of a deep well, with which is connected a Roth impeller pump direct-connected to a vertical 40-hp Western Electric motor and delivering to a sump from which the pressure pumps draw. This sump is connected to a large underground storage tank which has a high-water overflow to two artificial lakes on the grounds. These artificial lakes cover 17 acres, and, among their other duties, the pumps must take care of the radiation from the lakes in summer.

There are two Gould triplex pressure pumps direct-connected to 25-hp Crocker-Wheeler motors, and they have a combined rating of 500 gal. per minute. These tanks deliver to two pressure tanks operating on the Kewanee system. These tanks are noticeably large, being 9 ft. in diameter and about 40 ft. long. In Fig. 3 is shown a view of the vertical deep-well pump in the background with the triplex pumps in the foreground and one of the large pressure tanks at the left. A small air compressor belted to a 2-hp Crocker-Wheeler motor supplies air renewal to the Kewanee tanks and also furnishes air pressure for the starting burners and for the self-starters on the engines.

Lead-covered cables laid in conduit transmit the electricity from the power station to the switchboard in the basement of the house. The house is wired on the three-wire system, as mentioned, and two balancer sets are used. There are about 1600 lamps on the premises, many of those in the residence being of 8 cp and used in candelabra. The fixtures are imported and are elaborate and artistic. Throughout the house frosted bulbs are used exclusively. Not only the main residence, but the stable, the coachman's cottage, the engineer's house, the farmhouse, the greenhouse and the Italian gardens are electrically lighted. A private telephone line connects the power house and the residence.

Motors are used in the house for a variety of purposes. They are operated at 250 volts and required for various types of laundry machinery, vacuum cleaners, hot-water pumps, etc. There is also an electric elevator in the house. Electric flatirons are used, and the butler is provided with an electrically heated warming oven.

In Fig. 2, beyond the switchboard, is shown the oil cabinet. The 2000-gal. tank for the kerosene is located outside the power house in the ground, and the oil is pumped from this tank into the oil cabinet and thence fed to the engines by gravity. In Fig. 2 is also shown, at the left on the wall, one of the automatic starters for the triplex pumps used in connection with the water works. It is to be noted in connection with the switching gear that the equalizer switches are placed on floor pedestals near the generators and not installed on the switchboard.

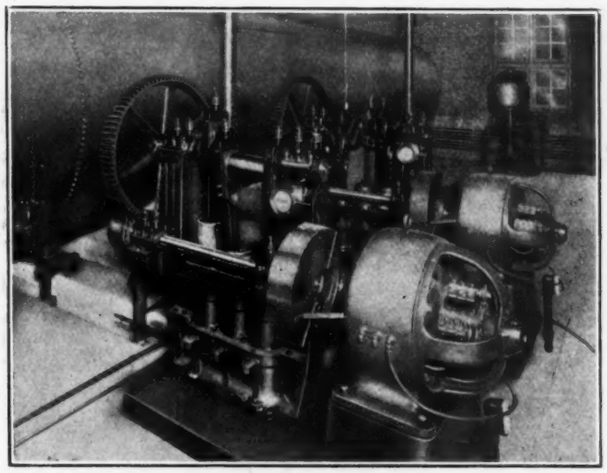


Fig. 3—Well Pump and Pressure Tank.

As the plant is located at some distance from the city, it is particularly important to provide unusually complete repair equipment. There is an electrically operated drill and an emery wheel, grinders, blowers, etc., all electrically operated by direct-connected motors. The power house is also supplied with portable drills, stocks and dies and a complete set of tools. There is also a portable ammeter and a portable voltmeter, so that the engineer in charge, Mr. E. C. Boecher, is enabled to do all ordinary electrical repairs that are necessary about the entire establishment.

ELECTRICAL MACHINE FOR CUTTING MUSIC ROLLS.

At a meeting of the engineering section of the American Association for the Advancement of Science held in Boston on Dec. 29 and 30, Dr. John F. Kelly read a paper entitled "Some Notes on the Cutting of Music Rolls, and on a New Machine for Making Master Rolls." The machine described is illustrated herewith. It is used for punching holes of the proper length of proper size in a metal roll, which is then used as an enlarged pattern for the playing rolls.

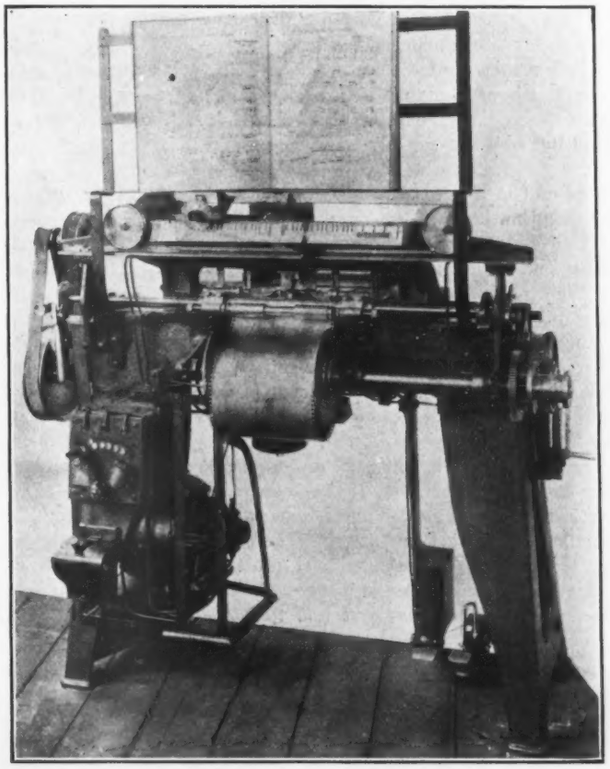


Fig. 1—General View of Electromagnetic Music-Roll Cutter.

In the master-roll machine, a table or carriage is movable right and left transversely to the line of motion of the roll to be perforated. Referring to Figs. 2 and 3, this table carries the die 38 and a graded set of punches 37. Motion is communicated to the table through the rack 9 and pinion 10. The direction of the motion is determined by the throwing into mesh of either of the bevel gears 12*L* or 12*R* by means of the corresponding clutches 13*L* and 13*R*.

The length of the note is determined by the number of punches striking. This number is fixed by setting the index 32 which controls the stepped punch selector 30. By fixing the throw of the rack this selector fixes the depression of the punch rod and so the number of punches striking. The spring clutch 57 for the worm gear 25 and 26 conveying the power for the operation of the punches is put into operation when the magnet 55 releases the stop 56. The forward feed of the roll is determined by the ratchet and pawl 53 and 54.

To come now to the peculiarly electrical features of the machine, the index 2, which is freely movable over the scale 51 representing the notes of the piano and the markings for control of expression, carries a brush 39 which can establish connection between a main 41 and one of the two branches 48*L* and 48*R*. When the brush rests on the insulated segment (59) between the branches, no connection is made and the table remains at rest. When, however, the brush is shifted, say, to the right, the corresponding branch circuit, which includes the magnet operating the clutch for the right-hand bevel gear 13*R*, is closed, the gear is put in mesh and the table begins to travel toward

the right. This movement will continue as long as the circuit remains closed. A look at the diagram will show, however, that the conductors, forming the terminals for the two branch circuits along which the brush moves, are themselves movable and are geared to the table so as to move with the latter. The motion will, therefore, stop as soon as it has brought the insulated segment under the brush. The gearing is so proportioned that the insulated segment is brought under the brush when the table has moved to the requisite extent to set the punches in the proper position for cutting the note shown by the index accompanying the brush.

The precision of the setting, it is clear, will be dependent on the width of the insulated segment. As this may be quite narrow, and as the ratio between the length of the scale 51 and the width of the roll to be perforated is large, the error in setting the punches may be made extremely small. Perfect precision in this respect, however, is not sought in the present mechanism, because the auxiliary locking device, shown at 16, 17, 18 and 19, makes an easier way of securing the final adjustment. This auxiliary apparatus is primarily intended to prevent any accidental displacement of the table before or during the operation of punching. It will be seen that if the primary location sets the punches within half the width between two adjacent teeth on the rack 19, the difference between the teeth being equal to the spacing of rows of notes, the locking action must also ensure precise adjustment. Back-lash is, of course, entirely prevented.

In working the machine the operator first sets the brush bearing index 2 on the scale at the note or expression marks to be cut, and then turns the punch indicator 32 to set the required number of punches for action. The carriage rack index 3 will by this time have come into line with the brush index 2, showing that the punches are in place. Pressure on a pedal then puts the locking device 16, 17, 18 and 19 into action, and by means of the releasing magnet 55 and the spring-actuated clutch 57 depresses the punches. When the roll has been cut across from one side to the other it is moved forward a proper distance by means of the ratchet 53, and a new series of perforations is made. As the machine is free from back-lash, the cutting may take place from left to right or vice versa.

Although the master roll is perforated with mathematical accuracy, and all changes in tempo are ignored, a playing roll having the tempo varied to any desired degree can be had by introducing the variations in the reproducing machine.

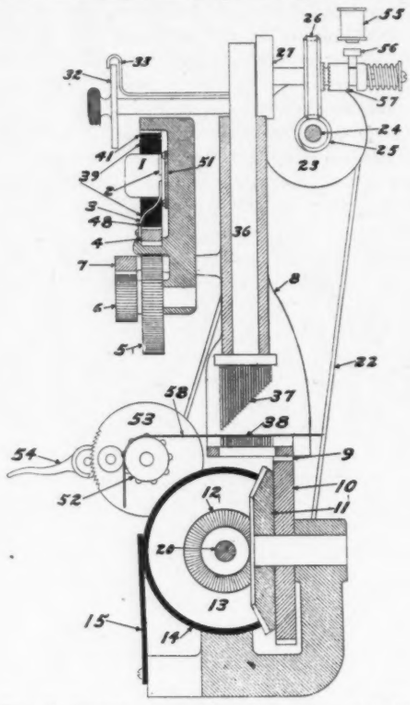


Fig. 3—Details of Music-Roll Cutting Machine.

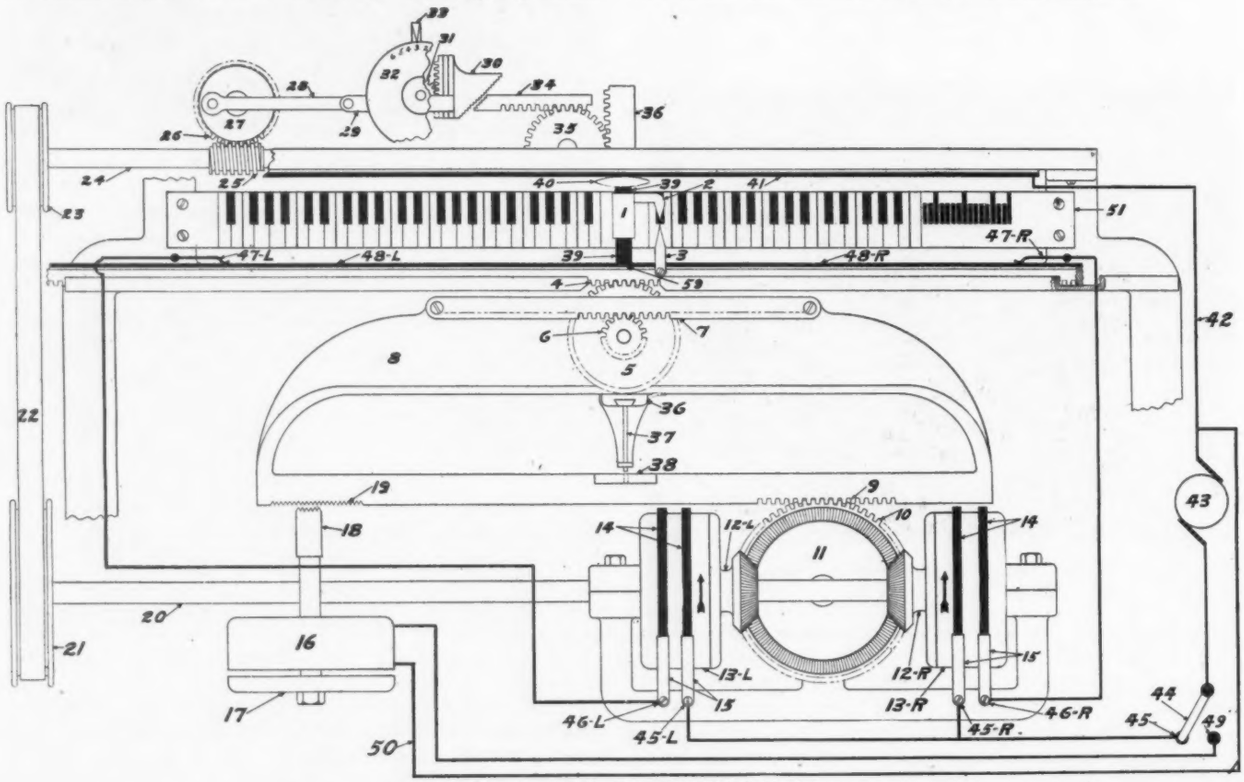


Fig. 2—Diagram of Music-Roll Cutting Machine.

This machine decreases the length of the roll for each passage of music in the required degree while actually preserving the time-ratios of the individual notes. The ratio between the master and playing roll is controllable from moment to moment so that the best artistic effects are obtained. This feature is especially valuable in obtaining fine shades.

INSTALLATION COST OF A MODERN STEAM TURBINE PLANT.

The installation costs of modern generating plants are closely associated with the broader questions of administrative policy, rates, service and total cost of production. Specific instances of plant expense, whether in the form of contract prices for accomplished work, or in estimates backed by ample engineering investigation, are valuable to public-utility executives and technical staff officers. In the following paragraphs are printed the detailed costs of installing a recently completed 2500-kw central station in a building having an ultimate equipment of 10,000 kw.

The plant consists of an addition to the main station of the company located on the river front of a large city in the East, the extension being mechanically independent of the main station, but tied to it electrically so that both are operated as one unit. The station building is a brick structure with concrete foundations laid on piles. The floor of the basement is about 8 ft. below the river level, and the usual division of the plant into an engine-room and a boiler-room is followed. The extension is to all intents a separate plant 145 ft. long by 112 ft. wide. The station is about 45 ft. high to the eaves on the front side and 32 ft. high at the rear. The height at the front is necessitated by the use of vertical boilers in the plant. Over the boiler-house is a concrete expanded-metal roof with a tar-and-gravel top, and above the turbine-room is a plank, tar and gravel roof supported by steel trusses. A fireproof wall separates the boiler and turbine rooms.

The boiler plant consists of six 400-hp Hazelton vertical units, equipped with Murphy stokers. Each boiler is provided with steel stack, 48 in. in diameter and 30 ft. in height above the boiler top. Coal is delivered to the station by a locomotive-type radial jib crane driven by a 500-volt motor, and the fuel is handled in a motor-driven crusher and conveyor installation, with bucket elevator and automatic scales, designed to handle 50 tons of coal per hour. The ashes are also handled by a motor-driven conveyor. A Jewell filtration plant is installed, with motor-driven agitator. Steam-driven feed pumps are in service, but the rest of the auxiliary equipment is electrically operated. A Deane counter-current jet condenser is in service, with motor-operated circulating, wet and dry vacuum pumps. One 2500-kw Westinghouse-Parsons two-phase, 60-cycle, 5600-volt turbo-alternator is at present installed, and the station is served by a 25-ton Niles hand-operated crane.

The relatively high cost of the building is due to the company's plan to erect the complete superstructure and foundations large enough at the outset to house the ultimate equipment of the plant. Pro rata the approximate initial cost of the plant would be about $70 per kilowatt if the building had been sufficient for the initial installation only. The cost of feed-pump equipment and piping for feed water, as well as the switchboard installation, is somewhat lower than would have been the case had the plant not been an extension of an original station, although independent from the latter in almost every particular. The company owned the land upon which the plant was built before the station was designed, and no figure of the real-estate value is therefore included.

Certain additional details relating to the above items are included to complete the figures. The intake crib for condensing water is 24 ft. long, 10 ft. wide and 10 ft. high, spruce, hemlock and chestnut timber being used. The turbine steam piping consisted of one 9-in. angle valve, 40 ft. of 9-in. pipe, five 9-in. bends, 205 ft. of small piping, ½ in. to 1¼ in. in diameter, and various small fittings. The turbine-room floor contained 12,960 lb. of plates, carried on 35 12-in. x 24-in. brick piers. In the boiler-room floor were used 26,319 lb. of steel I-beams. Twenty-seven Star ventilators and funnels were used. The painting included two coats upon 8000 sq. ft. of doors and windows, and 68,500 sq. ft. of inside work. The area of the boiler-room roof is 7290 sq. ft., and of the turbine-room roof 9446 sq. ft. The boiler feed-pump piping included 86 ft. of 2-in. pipe and 95 ft. of 3-in. pipe. For the gland water supply 174 ft. of 1-in. and 1.25-in. pipe was used. Two damper regulators were installed, and the city water supply was measured by a 6-in. meter. Two switchboard panels and 1600 ft. of 300,000-circ. mil cable were installed. Included in the boiler steam piping was 380 ft. of 5-in. pipe, six iron headers, 17 5-in. bends and hangers, bolts, gaskets and fittings, with two 12-in. valves at $114.70 each, and six 5-in. valves at $35 each.

The estimated cost of adding a second turbine rated at 2500 kw to the plant, the values being expressed in dollars per horse-power, are given in the above table.

COST OF STATION IN DETAIL.

Excavating 12,517 yd., at $0.75	$9,117.75
Piling	7,055.04
Concrete foundations	26,838.50
Brick and carpenter work	14,045.00
Roof trusses	5,011.00
Six 400-hp boilers	28,800.00
Six Murphy furnaces	10,384.00
Coal conveyor	9,800.00
One 2500-kw Westinghouse-Parsons turbine	52,000.00
Condensing machinery	8,435.00
Feed water filter	4,500.00
Filter wash pump	598.00
Boiler feed pump	3,290.00
Feed water heater	3,720.00
One 50,000-lb. crane, hand-driven	6,625.00
Filter supply pump	200.00
Gland water pump	150.00
Gland water tank	480.00
Switchboard and wiring	3,100.00
Turbine-room floor	7,588.20
Boiler-room floor	1,268.88
Intake crib for condensing water	1,465.21
Boiler-room roof	2,088.52
Turbine-room roof	624.45
Cornice	1,491.97
Ventilating system	1,001.25
Plumbing	436.31
Heating system	472.00
Painting	414.00
Stairways	2,204.00
Steam piping for turbine	409.80
Steam piping for boiler feed pump	100.58
Steam piping for gland water supply	37.48
Damper regulators	165.30
City water supply and meter	950.62
Steam piping for boilers	3,983.36
Pipe covering	669.10
Feed water piping	4,606.80
Water supply and discharge piping	4,393.98
Hot well	485.61
Filter piping	934.90
Total	$229,942.41

PRINCIPAL COSTS PER KILOWATT INSTALLED.

Boilers	$11.52
Furnaces (Murphy type)	4.15
Turbine set	20.80
Building and foundations, complete (for 10,000 kw ultimate)	30.33 ($7.58 ult.)
Condensing equipment	3.37
Other items	21.81
Total cost per kilowatt, initial equipment	$91.98

Boilers	$12.00
Stokers	4.32
Filter	2.00
Boiler piping	1.67
Pumps	1.40
Turbine set	16.00
Condenser	2.20
Turbine piping	.50
Pipe covering	.50
Wiring and switchboard equipment	1.00
Installing stoker, turbine and piping, labor and material	1.00
Total	$42.59

MAGNET STEEL AND PERMANENT MAGNETISM.

In the issues of *Stahl und Eisen* for Oct. 27 and Nov. 10, 1909, is an interesting article on "Magnet Steel and Permanent Magnetism," by Mr. G. Mars, who is the engineer of the famous "Böhler Brothers" Steel Works at Kaffenberg, Germany, consisting of a résumé of the results of considerable experimental work, which are most valuable, and of a long discussion of them.

In opening, the author says that the first demand of the electrical engineer from the steel industry is for a material that can be very quickly magnetized and which, when these forces are withdrawn will, as completely and quickly as possible, lose its magnetism. As such a material is used extensively in dynamos, it must also possess a small hysteresis with great permeability.

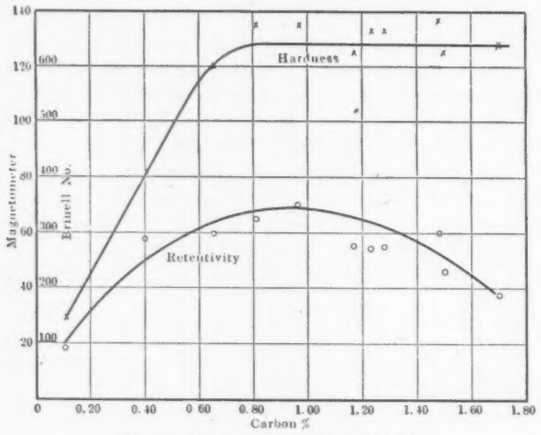
These requirements are stated to be admirably fulfilled by an iron alloy containing from 2.0 to 3.5 per cent silicon, and very

low carbon content, not exceeding 0.10 per cent. An induction curve is given for a 3.5 per cent alloy. The permeability is not much smaller than that of good soft iron, but the hysteresis loss is more than 40 per cent smaller.

The second demand of the electrical engineer is for a material the very opposite to the one described, for permanent magnets. Such steel should possess great hysteresis, resulting in the desired retentivity, great hardness and a small grain. While the ideal material for dynamo construction has been almost reached in silicon steel, the question of the best material for permanent magnets has not yet been settled. After several paragraphs relating to the known importance of this subject, the author gives his own experiments and results.

The materials worked upon were partly taken from the miscellaneous stock of Böhler Brothers, and were partly specially made in the crucible furnace. The testing of the steels for permanent magnetism was carried out on finished magnets of the well-known telephone magnet type. These magnets are made of steel of rectangular section, 20 mm x 10 mm, and are of U-shape, with straight legs. The total length is 125 mm, and the inside diameter of the circular end is 45 mm. In making them a sufficient quantity of steel was cut from the 20-mm x 10-mm bar, and without a previous annealing was heated to a suitable temperature and bent. It was then allowed to cool, and the legs carefully finished to length.

Great care was taken in hardening these magnets. They were



Curves Showing Results of Tests.

heated in a very good gas-fired furnace, and control of the temperatures maintained with two pyrometers. One was a Le Chatelier, the junction being placed on the bottom of the furnace, between the legs of the magnet. The other was a Féry optical pyrometer. This latter gave slightly higher results than the Le Chatelier, the variation, however, not being more than 10 deg. C. to 20 deg. C. In the succeeding tables the average results of the two instruments are given.

The magnets were quenched in either water or oil. The time from the removal from the furnace, placing the magnet in a clamp to prevent distortion in hardening, and plunging in the hardening medium, was from four to five seconds. The hardened magnets were then ground accurately to size, and magnetized in the usual way by stroking with a strong electromagnet.

They were then tested directly by the magnetometer. The apparatus used was that of Koepsel, furnished by Siemens & Halske. It is comparable to the best of the ordinary galvanometers. No yoke is used, but the legs of the magnet, with its keeper, are placed directly around the turning part of the instrument, so that the magnetism can be measured directly. The readings are naturally only of relative value.

In the following tables are shown the results obtained with ordinary carbon steels, with tungsten steels, chromium steels, chromium-tungsten steels, and finally, special steels.

The analyses are given, and the results of the Brinell ball test for hardness. The latter were obtained by using a ball 10 mm in diameter, and a pressure of 3000 kg.

Each result is the average of those obtained on two magnets. Water, at from 10 deg. C. to 15 deg. C., was alone used as the hardening fluid. The results are shown graphically in the accompanying curves.

The hardness of these quenched steels reaches a maximum at between 0.8 and 0.9 per cent carbon—in other words, at

TABLE I.—CARBON STEELS.

	Analysis			Hardening.		Magnetometer		
No.	Car.	Sil.	Man.	Temp. °C.	Brinell, No.	Immediately After.	After 8 days.	P. C. loss.
1	0.11	0.016	0.16	880	143	18.0	17.0	5.6
2	0.40	0.10	0.30	860	410	57.5	56.5	3.4
3	0.65	0.15	0.12	850	600	58.5	56.5	3.0
4	0.81	0.08	0.20	820	674	64.5	62.0	3.9
5	0.97	0.20	0.15	810	674	70.5	69.0	2.2
6	1.17	0.18	0.23	780	627	55.5	53.0	4.6
7	1.23	0.17	0.33	780	668	54.5	50.5	7.4
8	1.28	0.18	0.25	765	668	55.5	53.5	3.6
9	1.48	0.20	0.22	755	683	60.5	58.0	4.2
10	1.50	0.12	0.30	750	627	46.0	44.5	3.6
11	1.70	0.12	0.65	740	640	37.5	36.0	4.0

Arnold's saturation point. With increasing carbon there was very little variation. The maximum retentivity is shown at 0.97 per cent carbon, and with increasing carbon it falls considerably. This is interesting in view of the results obtained by Madame Curie, who found the highest retentivity in a steel with 1.20 per cent carbon. It evidently corresponds with a steel consisting wholly of pearlite. Such a steel has the finest structure in the annealed and hardened condition.

TABLE II.—TUNGSTEN STEELS.

	Analysis							Magnetometer		
No.	Car.	Sil.	Man.	Tun.	Hardening Temp. °C.	Liquid.	Brinell, No.	Immediately after.	After 8 days.	Per cent loss.
1	1.15	0.20	0.23	0.68	780	Water	600	69.5	68.5	2.9
2	1.16	0.19	0.20	1.20	750	"	744	76.5	76.0	1.3
3	0.64	0.25	0.26	1.12	720	"	713	76.5	73.5	3.9
4	0.62	0.22	0.20	1.96	800	"	782	85.5	84.0	1.8
5	1.20	0.28	0.29	3.22	740	"	782	66.5	65.0	4.5
6	0.58	0.18	0.26	5.47	930	"	782	90.5	90.5	.0
7	1.25	0.27	0.30	8.65	930	"	782	61.0	58.5	4.1
8	1.25	....	....	30.0	850	Oil	578	19.0	....	....

The results with the tungsten steels are particularly interesting because this is the usual material used for permanent magnets. The composition generally is about 0.60 per cent carbon and 5.0 per cent tungsten.

A glance at Table II, in comparison with the results of the ordinary steels, will show the great value of a tungsten addition, the increase being from 20 to 50 per cent. Unfortunately, the carbons of this series vary so much that it is impossible to plot them graphically. No. 2 and No. 5 are particularly noticeable, as the latter would be expected to give a much higher result. Chromium, as shown in Table III, has a similar influence to that of tungsten.

In Table IV are given the results of the chromium tungsten steels, the most interesting of the whole series.

Finally, in Table V, are given the results with steels of

TABLE III.—CHROMIUM STEELS.

	Analysis							Magnetometer		
No.	Car.	Sil.	Man.	Chr.	Hardening Temp. °C.	Liquid.	Brinell, No.	Immediately after.	After 8 days.	Per cent loss.
1	1.01	0.20	0.25	1.21	720	Water	713	86.0	83.5	2.9
2	0.82	0.19	0.18	1.40	750	"	652	94.0	90.0	4.3
3	1.05	0.15	0.24	1.62	750	"	652	95.0	94.0	1.1
4	0.78	0.19	0.20	1.30	750	"	782	93.5	92.5	1.0
5	1.02	0.21	0.23	2.14	750	"	600	93.0	90.0	3.2
6	0.54	0.18	0.26	4.25	750	Oil	514	84.5	82.0	3.0
7	1.20	0.22	0.25	4.05	730	"	655	86.0	83.5	2.9
8	1.80	0.21	0.24	12.45	760	"	640	55.0	53.5	2.7
9	2.60	0.27	0.26	2.46	750	"	713	50.5	48.5	4.0

various compositions. Nickel steel, nickel chrome steel, etc.; as these special elements are not ordinarily used in the production of magnets, the results are of interest. Molybdenum is of undoubted value, but cheaper magnets can be made using tungsten or chromium, or both together.

A comparison of the different series shows that ordinary carbon steel is not of equal value for permanent magnets to the steels with some special constituents which increases the hardness and the rigidity of the inner structure.

The results are then given of a series of tests on steel No. 6 of Table II, to determine the influence of the microstructure and of the quenching temperature on the permanent magnetism. These results will not be given in detail, nor will the theory of magnetism, which the author outlines. It is summed up in the third, fourth and fifth conclusions below.

TABLE IV.—CHROME TUNGSTEN STEELS.

	Analysis						Magnetometer.		
No.	Car.	Cr.	Tung.	Hardening Temp. °C.	Liquid.	Brinell, No.	Immediately after.	After 8 days.	Per cent loss.
1	1.03	1.23	1.25	760	Water	600	84	82.5	1.8
2	1.22	1.23	0.96	760	"	600	97	95.5	1.5
3	0.51	1.05	1.27	750	"	578	80	..	..
4	1.38	0.66	1.33	750	"	627	87.5	85.0	2.9
5	1.32	0.65	3.89	740	"	837	84.5	84.5	0.0
6	0.54	3.52	10.42	1100	Oil	837	84.5	82.5	2.4

The lessons from the experiments are given in the following conclusions:

(1) Steel for permanent magnets has the opposite properties, electrotechnically and metallographically, to soft dynamo material.

(2) The greatest retentivity of the ordinary carbon steels is shown with about 0.97 per cent carbon, corresponding to the entectoid carbon percentage. The smaller retentivity of steels with less carbon is due to their lesser hardness; with more carbon because of there being less free iron.

(3) The greater strength of the special steel magnets compared with carbon steel is due to the existence of more free iron in them with equal hardness.

(4) The constituents of magnet steels do not influence directly the strength of the magnetism, but with equal hardness, because of the displacement of a greater or less amount of the efficaceous iron.

(5) For great retentivity it is necessary that the steel be glass-hard, of very small structure, and contain as much free iron as possible. With steels of equal hardness the amount of permanent magnetism is the greater, the more the percentage of free iron.

(6) The magnet steel, with about 0.6 per cent carbon and 5.0 per cent tungsten, shows the highest retentivity when quenched from a temperature of 930 deg. C. to 950 deg. C.

TABLE V.—SPECIAL STEELS.

	Analysis					Magnetometer.			
No.	Car.	Special.		Hardening Temp. °C.	Brinell, No.	Immediately after.	Eight days after	Per cent loss.	Fluid.
1	0.92	Man.	0.99	800	600	71.0	70.5	0.7	Water
		Cr.	0.43						
2	0.45	Sil.	0.94						
		Cr.	0.78	800	578	77.0	74.5	3.2	Water
3	0.50	Sil	0.50	800	600	87.0	85.5	1.7	Water
		Cr.	1.10						
		W.	1.00						
		Mo.	1.10						
4	0.82	Va.	0.37	800	946	67.0	64.5	3.8	Oil
5	.22	Mo.	3.85	800	600	64.0	63.0	1.6	Oil
6	0.68	Sil.	1.63	820	782	84.5	82.5	2.4	Water
		Man.	0.58						
7	0.10	Sil.	3.70	830	226	6.0	6.0	0.0	Water
8	0.95	Man.	12.00	860	228	Nonmagnetic			Water
9	0.20	Man.	0.50	850	418	19.0	18.0	5.3	Water
10	0.20	Ni.	5.00	830	364	44.5	41.5	6.7	Water
11	0.18	Man.	0.40	830	437	34.0	32.0	5.9	
		Cr.	1.00						
		Ni.	4.00						
12	0.40	Man.	0.40	900	131	Nonmagnetic			Water
		Ni.	25.00						
13	0.40	Man.	0.40	850	145	Nonmagnetic			Water
		Ni.	36.00						

Central Station

Management, Policies and Commercial Methods

IMPROVED STREET LIGHTING SERVICE FOR NEWTON, MASS.

Following the acquisition of the electrical service of the city of Newton, Mass., by the Edison Electric Illuminating Company of Boston, a new street lighting contract has just been signed which will provide better illumination at a reduced net cost than obtained under the administration of the Newton & Watertown Gas Light Company. Based on the same number of lamps the new contract makes a net saving of $433 per year for the city. Both arc and incandescents are covered, and in the case of the former the price is reduced from $90 to $84.08 per year each, with all-night and every-night burning. The price for incandescent lamps is increased from $14.50 to $15 per year, but this is far more than offset by the substitution of 40-cp series tungsten lamps for the old 25-cp carbon lamps formerly in service. The incandescents are used until 12:30 a. m. The company agrees to install new incandescent fixtures and to change the arc lamps to either the magnetite or the flaming type as the city authorities request.

There are some 200 arc lamps and 1419 tungsten lamps involved. The company agrees to expend $100,000 during the next five years at the rate of $20,000 per annum, for underground conduit construction. The new contract has a life of 10 years. Newton is one of the most beautiful residential suburbs of Boston, and the work of the Edison Company in the city has been specially planned to harmonize with the surroundings of the community. All of the electrical energy for the public and private service is transmitted to a substation in the Newtonville district of Commonwealth Avenue from the L Street generating station in South Boston. Architectural considerations were given due prominence in the design of the former building, which stands in a residential district of growing attractiveness. A well-equipped district office has also been actively at work on Center Street, Newton, since the purchase of the electricity supply business by the Edison Company.

MONTHLY VARIATIONS OF CENTRAL-STATION EARNINGS.

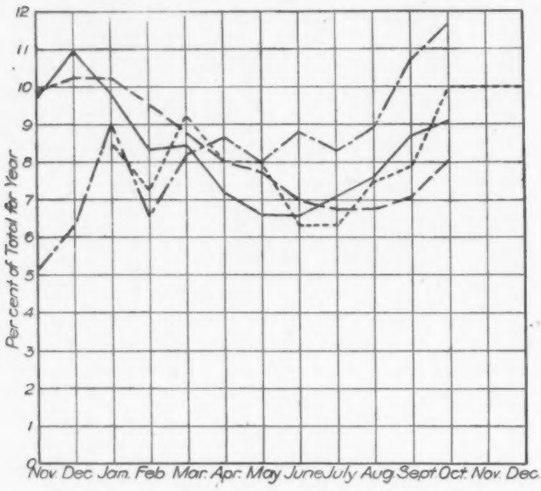
In making estimates as to future earnings and apparatus requirements the manager of the rapidly growing central station is frequently called upon to look up records of the variation of output from month to month in central electric generating stations operating under various conditions. In a settled community where the rate of growth in population is slow and the business has been fairly well developed for many years the percentage of the total year's output in one given month is fairly constant from year to year. In cases where the growth of the business is rapid for any reason the percentage of the total output of the year in any one month is dependent much more on whether the month under consideration is taken early or late in the year.

The accompanying curves show the monthly variations under several conditions. Curve 3 shows the variation in kw-hour output from month to month in a small 290-kw station supplying electricity for lamps and motors in several small towns. In this case the business is enjoying a moderate rate of increase, as the population is stable and the growth of the electric lighting and motor-service business is due to the increase in wealth and to the growing appreciation of the convenience of electric service.

Curve 2 shows the variation in kw-hour output of a 7000-kw

plant in a large city. As it is given for a calendar year, while that for curve 1 is for a year ending Oct. 31, the curves 1 and 2 are hardly comparable. In curve 2 the business of the company was being built up rather more rapidly than usual owing to the introduction of cheap water-power and the inauguration of an active new business department.

Curve 3 shows the variation in monthly earnings in a small



Variations of Earnings and Output by Months.

town of 1200 population receiving energy from a substation. Conditions in this town are very stable.

Curve 4 shows the earnings in a town of about 4000 population where the growth in business and population has been very rapid. The earnings are more than doubling each year. The earnings shown in both curves 3 and 4 are based on meter readings entirely except as regards a certain amount in street lighting.

THE WEST HAM (ENGLAND) CENTRAL-STATION SALES DEPARTMENT.

By Glenn Marston.

West Ham is a borough of London, situated in the East End, and devoted wholly to manufacturing. The principal business for the central station, which is municipally owned, is the sale of energy for motors. For this purpose an active sales organization has been built up under the supervision of Mr. A. Hugh Seabrook, for many years resident engineer for the borough and now its consulting engineer.

The sale of energy for lamps is not the prime object of the sales department. The department is a distinct organization whose main object is the sale of appliances and equipment, thus directing the growth of energy consumption so as to prevent the disastrously high peaks and low valleys typical of most British central stations.

Mr. Seabrook has placed the West Ham sales department on an independent financial basis (much to the dissatisfaction of the contractors, who are constantly obstructing his methods) and his attitude is clearly set forth in the last report of the borough.

"I do not," he says, "for one moment, associate myself with the theory that a sales department need not be self-supporting because it increases the business of the main undertaking. I consider it should stand on its own bottom as a separate organization. Neither, as a supply [of energy] manager, do I recognize the theory that a municipal corporation, having power to supply electricity might, for the sake of increasing the business and employment of the borough, supply electricity for industrial purposes below cost price."

Practically all of the large motor users take energy from the central station, and in most cases the sales department has also done the wiring and contractor's work. A great deal of effort is spent in securing new industries for the borough. This work is charged against the sales department, although that department makes no profit from industries secured except when the wiring contract is given to the central station. Although the sales department acts mainly as contractor, the canvassers are paid a commission on energy sold based on the number of kilowatts obtained. This commission is paid whether the department gets the wiring contracts or not, and it is, of course, a loss to the department when the wiring is not secured. It would appear that such expense ought to be borne by the central station, since it is the central station which benefits, even though the sales department is a separate organization.

Mr. Seabrook is the implacable enemy of the contractor, holding that only three classes of people are interested in electricity—the manufacturer of equipment and supplies, the manufacturer of energy, and the consumer. The contractor, he says, is an artificial interloper. That a deplorable lack of cooperation exists between the contractors and central stations in England cannot be denied, and it is the inability or unwillingness of the contractor to assist the central station which has caused the establishment of supply or "sales" departments similar to the almost universal custom among British gas companies.

The West Ham sales department employs seven canvassers—three for motor service and four for lighting. These canvassers may, at any time, enlist the aid of such technical members of the station's staff as they may need. Each canvasser has a separate area, and as soon as a prospective customer has become interested the whole department machinery is set in motion.

British manufacturing plants are dominated by boards of directors, so that the process of securing them as motor users is both slower and more difficult than in America. The usual procedure is for the canvasser to interest the manager or managing director. The manager takes up the question at the next directors' meeting and a committee is appointed to investigate. Meanwhile, if lucky, the canvasser has obtained permission for the department to examine the factory. When the department's technical staff secures sufficient data, a conference between three or four men from the central station and the directors' committee is arranged, and the whole question threshed out. If the committee is favorably impressed the performance is repeated before the whole board of directors, "and the contract is usually signed at once."

Gas competition is very keen, and rates must be figured very closely to secure the business. It is usually found that, by considering the probable load factor in relation to the maximum demand, a rate can be given which is less than the rate offered by the gas company.

Each canvasser makes a daily report of calls and progress when he returns in the evening. All letters to prospective customers are written by the canvasser. In addition to the written report, each canvasser has a conference with the manager every evening, but there is no general meeting where all of the prospective customers are discussed.

There is, however, a weekly or fortnightly meeting of all interested members of the central-station staff, which is addressed by some electrical manufacturer's representative, the subject being always one concerning selling methods for the various supplies produced by the manufacturer.

West Ham maintains an aggressive publicity department, the cost of which is charged against the sales department. A quarterly bulletin is issued, mainly of interest to motor users, while a continuous succession of folders and pamphlets is produced, setting forth the desirability of West Ham as a manufacturing center in general, and of cheap electric energy in particular.

In its efforts to induce new industries to locate in the borough, the central station is ably assisted by the various railways. Throughout Great Britain the relations between the railways and the central stations are closer than in America, and profitable results are produced for both.

GAS-PRODUCER PLANT VS. CENTRAL-STATION SERVICE FOR CHARGING ELECTRIC VEHICLES.

Comparison of Cost Based Upon Data from Practical Operation.

By RODERICK D. DONALDSON.

The obtaining of cheap energy for charging electric vehicles has been, and is, a vital problem in the electric vehicle business. This problem is so essential that many garage companies who have an agency for an electric vehicle have found it necessary to charge the batteries for their customers at little or no profit to themselves because the energy cost may be sufficiently high in some cases to decrease the sales of the electric vehicle.

With a certain garage this question was thoroughly discussed and a gas-producer outfit was put in on trial. The garage had been purchasing its energy from a central station, the single-phase current being rectified by the aid of mercury-arc rectifiers. The following report is on the actual costs of the gas-producer plant during one month's run and a comparison with the costs of the same service with purchased energy. The generator was of 65-kw normal rating, and the engine was rated at 100 hp. The e.m.f. at the busbars was maintained at 115 volts. The load on this generator was approximately 8.75 kw as a maximum lighting load with 5 kw as an average for 11 hours, and 30 electric vehicles charged during the night, with 15 at any one time as a maximum.

A_1 = ampere rating during first part of charge.
A_2 = ampere rating during "fixing charge."
T_1 = time of first part of charge.
T_2 = time of "fixing charge."
CV_2 = voltage of fixing charge.
15 = difference in voltage between that at secondaries of transformer and that of the direct current or the loss in voltage through the rectifier.
115 = voltage of busbars.

In case of the 12-cell Baker battery this would work out as follows:

$(38 + 15) \times 20 \times 6.75 + (39 + 15) \times 9 \times 0.75 = 7.50$ kw-hours by rectifier.

$115 \times 20 \times 6.75 + 115 \times 9 \times 0.75 = 16.20$ kw-hours by rheostat.

In every case the saving was in favor of the rectifier as there were no cars requiring an e.m.f. higher than 96 volts. The method used in this charging, as seen from the above, was to hold the current constant until a determined voltage was reached when the current was decreased to less than half the former value and kept at this low value for a time ranging from 30 minutes to 50 minutes. This latter process is known as "fixing the charge." The energy consumption by the rectifiers was found to be approximately 75 per cent of that through the rheostats.

TABLE I.—ENERGY CONSUMPTION OF ELECTRIC VEHICLES.

Name of car	Class	Cells	Time on—P.M.	Volts on	Amps. on	Time off	Volts off	Amps. off	Kw-hours by busbars	Kw-hours by Rectifier	Kw-hours Saved by Rectifier
1—Babcock	1	36	9:20	78	22	1:30	94	8	9.31	8.41	0.94
2—Babcock	5	24	7:30	54	25	4:00	62	10	22.51	14.56	7.95
3—Babcock	5	24	7:30	55	22	11:45	62	10	7.53	4.85	2.68
4—Baker	6	12	7:30	36	20	3:00	40	9	16.20	7.50	8.70
5—Studebaker	4	28	7:30	68	18	10:00	72	8	4.60	3.40	1.20
6—Waverly	3	28	7:30	66	20	9:30	76	8	3.91	2.97	0.94
7—Waverly	3	28	7:30	68	18	10:00	76	8	4.5	3.55	0.95
8—Columbia	3	24	9:00	66	20	12:00	78	8	6.06	4.76	1.30
9—Waverly	3	28	7:30	70	15	12:30	76	10	8.00	6.48	1.52
10—Babcock	1	36	8:15	80	18	11:30	94	8	6.11	5.51	0.60
11—Babcock	2	36	9:30	80	18	4:00	87	10	12.53	10.81	1.72
12—Columbia	5	24	8:30	53	20	3:10	62	10	14.17	9.12	5.05
13—Babcock	1	36	9:20	80	20	4:30	92	8	14.99	13.40	1.59
14—Waverly	3	28	10:00	68	22	3:00	76	10	11.61	9.19	2.42
15—Babcock	1	36	9:50	80	20	2:00	92	8	8.66	7.69	0.97
16—Waverly	3	30	10:35	68	20	1:15	78	8	5.22	4.20	1.02
17—Babcock	2	36	12:20 a.m.	80	20	6:45	88	10	13.57	10.64	2.93
18—Babcock	1	36	10:40 p.m.	80	18	1:15	96	8	4.63	4.25	0.38
19—Baker	4	28	10:20	64	24	12:00	72	10	4.18	3.05	1.13
20—Babcock	1	36	1:00 a.m.	80	16	6:00	94	7	8.42	7.48	0.93
21—Studebaker	5	24	2:00	54	20	6:40	62	8	9.81	6.47	3.34
22—Waverly	3	28	11:20 p.m.	68	20	5:15	78	8	12.30	9.48	2.82
23—Columbia	5	24	1:15 a.m.	54	19	6:15	62	8	9.97	6.34	3.63
24—Waverly	3	28	12:30	66	20	5:45	76	8	12.99	9.84	3.15
25—Waverly	3	28	1:30	66	22	5:30	77	10	9.14	6.36	2.78
26—Baker	6	12	1:10	34	22	7:25	40	9	14.31	6.6	7.71
27—Blakeslee	5	24	2:00	52	20	6:10	62	10	8.99	5.72	3.27
28—Babcock	1	36	1:40	80	20	5:00	92	8	6.97	6.18	0.79
29—Babcock	1	36	2:45	80	20	5:10	92	8	5.42	4.72	0.70
							Totals		276.65	203.54	73.11

Table I gives a sample of the daily charging record. Table II gives the daily kw-hour output, the coal used in starting and the total coal, the gallons of oil, the coal per kw-hour and the cost per kw-hour due to coal only. In Table I is also given the class each car would belong in if charged by rectifiers according to the voltage necessary for its battery. As the e.m.f. at the busbars was 115 volts, there was a large loss of energy through the rheostats for such cars as the 12-cell Baker battery at 40 volts and the 24-cell Columbia battery at 62 volts. This loss is proportionately less as the charging voltage of the battery increases, for the voltage loss due to the rectifier is approximately constant at 15 volts, while with the rheostat e.m.f. the loss is 115 volts minus the charging voltage. In Table I will be found the saving for the different cars in kw-hours figured by the following formula:

$(CV_1 + 15) \times A_1 \times T_1 + (CV_2 + 15) \times A_2 \times T_2 =$ kw-hours by rectifier.

$(115 \times A_1 \times T_1)\ (115 \times A_2 \times T_2) =$ kw-hours by rheostat.

Where:

CV_1 = average charging voltage taken from curve of the voltage rise in the cell.

OPERATING EXPENSES.

The coal consumption during the month was 45,420 lb. (Table II), or 20.28 tons. This was white-ash pea coal at $4.90 per ton delivered. The oil consumption was 106.5 gal. at 17½ cents a gallon. The water used in the producer and in circulating was 36,000 cu. ft. at 3 cents per 100 cu. ft.

INSTALLATION EXPENSES.

Coal—20.28 tons at $4.90	$99.37
Oil—106.5 gal. at 17½ cents	18.64
Water—36,000 cu. ft. at 3 cents per 100	10.80
Wages	50.00
Supplies (approximately)	5.00
Repairs (as assumed from other data as monthly expense)	50.00
Total	$233.81

The cost of the producer, gas engine and generator, with operating switchboard, totaled $7,500. The foundations, installation, freight and hauling charges amounted to $700, making a total of $8,200.

The fixed charges were figured as follows:

Interest on investment, 5 per cent per year	$410.00
Depreciation (10 years' use), 10 per cent	820.00
Insurance, 2 per cent	164.00
Taxes, 1½ per cent	123.00
Total	$1,517.00

This gives a monthly charge of $126.42. There are two other items to be considered as expense against the plant. The first of these is the cost of lamp-renewals, because with central-

station service the lamps were renewed at no cost to the consumer; the second is the money paid to the central station for energy used at odd periods when the plant was not in operation.

LAMP RENEWALS.

Assuming 1750 kw-hours as the energy consumption due to lamps in the month, the equivalent is 35,000 lamp-hours, or on a basis of 800 hours' use of lamp, 43.8 lamps renewed per month.

43.8 lamps at 17½ cents.....$7.54

TABLE II.—30 DAYS CONSUMPTION RECORD.

Date		Kw-hours.	Oil (gals.)	Coal used in starting (lbs.)	Total Coal (lbs.)	Coal per Kw-hour	Cost of Coal per Kw-hour
Sept.	24	278.3	5	330	1,320	4.76	$0.01018
	25	286.2	1	240	1,120	3.91	0.00839
	26	305.8	5	420	1,290	4.22	0.00903
	27	342.5	6	300	1,410	4.12	0.00882
	28	314.9	9	350	1,350	4.28	0.00916
	29	320.1	7	350	1,280	4.06	0.00869
	30	340.5	8½	350	1,340	3.94	0.00843
Oct.	1	365.1	1	350	1,500	4.11	0.00879
	2	388.7	2	420	1,710	4.39	0.00939
	3	30.2	—	420	750	—	—
	4	378.9	1	420	2,160	5.70	0.01220
	5	339.5	—	350	1,610	3.74	0.00800
	6	284.6	3	180	1,320	4.64	0.00993
	7	325.8	4	180	1,170	3.59	0.00768
	8	385.6	5	180	1,620	4.20	0.00899
	9	369.2	3	240	1,650	4.46	0.00954
	10	240.0	1	480	1,860	7.75	0.01659
	11	354.8	2	300	1,740	4.90	0.01049
	12	358.1	4	120	1,290	3.60	0.00770
	13	343.9	3	420	1,920	5.58	0.01194
	14	344.8	3	240	1,620	4.70	0.01006
	15	290.3	9½	600	2,010	6.92	0.01481
	16	279.8	2	240	1,320	4.72	0.01101
	17	281.3	3	350	1,700	6.05	0.01295
	18	364.2	3	350	1,940	5.32	0.01138
	19	354.5	2	420	1,920	5.42	0.01160
	20	283.9	4	300	1,110	3.91	0.00837
	21	271.4	5	350	1,370	5.05	0.01081
	23	320.0	2	240	1,500	4.69	0.01004
	22	425.5	2½	350	1,520	3.58	0.00766
Averages	..		0.0112 gal. per kw-hour.			4.70	$0.01009
Totals	.....9,568.4		106.5 gal.		45,420		

PURCHASED ENERGY.

The energy from the central station was metered separately for the lamps and the batteries.

Lighting energy—294 kw-hours at 10 cents	$29.40
Battery energy—601 kw-hours at 6 cents	36.06
Total	$65.46

TOTAL EXPENSES.

Operating expenses	$233.81
Fixed charges	126.42
Purchased energy	65.46
Lamp renewals	7.54
Total	$433.23

This $433.23 represents the money paid for the following values of kw-hours:

Generated energy	9,568.4
Purchased energy	895.0
	10,463.4

This gives a unit cost of 4.14 cents per kw-hour for all energy used during the month. The actual cost of the generated energy is 3.76 cents per kw-hour figured on 9568.4 kw-hours for $360.23.

COMPARISON OF COSTS.

The unit cost of energy generated by the plant cannot be compared with the unit cost of energy purchased from the central station as the losses of energy with the former equipment mean a considerably larger total used than would have been used for the same service with rectifiers supplied with central-station energy. There is a certain indeterminate loss with the isolated plant which cannot be estimated. This loss is that due to the reasoning of the employees that when the electricity is generated at the garage it does not cost anything, and, therefore, no great care need be taken to minimize the energy used. There is, however, a concrete loss which, as explained above, is due to decreasing the voltage through rheostats over that lost with rectifiers. This loss can be estimated quite accurately, and is taken herein as 25 per cent of the power generated for charging purposes. The lighting energy was estimated at 1750 kw-hours. This is 20 per cent greater energy consumption for lighting than the records of two years for lighting the same buildings from central-station energy show it would amount to for the month during the trial run. Subtracting this value from the total generated energy leaves 7818.4 kw-hours generated for charging purposes. Seventy-five per cent of this is 5863.7 kw-hours. To be added to this is 601 kw-hours purchased from the central station for charging, making a total of 6464.7 kw-hours. Therefore, the energy costs for the same service from central station would be:

1750 + 294 = 2044 kw-hours' lighting energy at 60 cents	$122.64
5863.7 + 601 = 6464.7 kw-hours' charging energy (by contract 200 kw-hours—$105.00; all in excess at 3 cents per kw-hour)	238.94
Total	$361.58

To be added to this is the monthly charge due to breakage on rectifier bulbs, which in two years of business averaged $15 per month.

Energy costs	$361.58
Breakage on bulbs	15.00
Total	$376.58

The $376.58 represents the total money paid for the required service, or 8508.7 kw-hours. This gives a unit cost of 4.43 cents per kw-hour as against 4.14 cents per kw-hour for total energy purchased and generated with plant in operation and as against 3.76 cents per kw-hour for the energy generated only. However, the total costs show a saving in favor of central-station service.

Plant expenses	$433.23
Purchased energy expenses	376.58
Saving	$56.65

Therefore, a balance of expenses shows a monthly saving of $56.65 in favor of the purchased energy. The unit costs that should be compared are: $376.58 for total purchased energy of 8508.7 kw-hours necessary for the service, which equals 4.43 cents per kw-hour net central-station rate, and $433.23 of total plant expenses for 8508.7 kw-hours necessary for the service, which equals 5.09 cents per kw-hour net plant rate.

In the above report only real expenses have been taken into account, the rental of space occupied by the engine, generator and producer not being estimated, as this space could not have been used for any other purpose of real value. The expenses of the gas-producer plant and of the purchased energy show that the unit cost for energy is lower by the plant (3.76 cents) than the net unit cost of purchased energy (4.43 cents). However, due to the higher efficiency of the use of the energy when purchased, the monthly expenses of the isolated plant are higher than the monthly expenses due to purchased energy for the same service.

Wiring and Illumination

SIGN AND DECORATIVE LIGHTING.

The current issue of *Denver Municipal Facts* contains an article by Mr. Henry Reed, president of the Denver Art Commission, in which the artistic side of sign and decorative lighting is considered.

However effective, he says, the public lighting of the streets may be, the private lighting of stores and buildings is a matter of no less importance, and plays a vital part in creating the impression of a well-lighted city. Although considerable advance has been made in theoretical knowledge of artificial illumination, Mr. Reed considers that its practice still leaves much to be desired. While scientific principles must, of course, form the basis of all successful lighting, which side of the work calls for trained professional guidance, "something more is needed, and that something is sound, artistic judgment, which is not so conspicuous as it might be in the achievements of the illuminating expert. It is true, he is not always a free agent, and his clients must often share the blame. The light producer is anxious to sell light under any conditions, and the light consumer, whose ultimate aim is commercial advertising, some-

times fails to see the connection between good art and good advertising."

In Denver it has been the practice to issue permits, under certain specified restrictions, for illuminated signs projecting from the buildings over part of the sidewalk, the reason being to encourage such a use of lighting as will add to the cheerful appearance of the streets at night. Mr. Reed adds that "it must, however, be remembered that the sidewalks and streets are public property and no citizen can claim the right to use them for private advertising. When, therefore, we find that attempts are made to evade the restrictions that necessarily accompany permits, that the lighting is often discontinued while the signs themselves remain as permanent disfigurements by day, that cheap and unsightly construction is more in evidence than good design, we are justified in calling attention to the matter and inviting co-operation in an effort to maintain and deserve for Denver the name of the City of Lights."

In answer to the query: How can more light be used and better results be obtained? Mr. Reed says a few examples exist in the business district showing that the most noticeable effects are produced by flat and outline lighting. With projecting signs the limit of advertising capacity is soon reached, because of the confusion produced by the interference of lights as seen from the sidewalk. "This conflict disappears when the signs are placed on the face of the building, and in cases where they are supplemented by outlines that define its architectural features, we find the most beautiful and effective application of commercial lighting. A certain amount of quiet surrounding space enhances the value of whatever device is displayed upon it."

In conclusion, Mr. Reed says that extravagance of light without order defeats its own purpose, as also does excessive brilliancy. An arc light should be encased in an opal globe, and should be hung sufficiently high to prevent fatigue to the eye. Colored lights are objectionable, and roof signs should not be permitted.

COLD BENDING OF LARGE IRON CONDUIT.

By George H. Westerman.

Excellent bends can be made economically in wrought-iron conduit of nominal diameters as great as 3½ in. without the aid of heat. The only appliances necessary are a jack screw and a wooden bending form, in addition to substantial supports capable of sustaining the thrusts of the jack screw and the piece of conduit being bent. However, members of buildings or wooden blocks properly arranged can be utilized for this purpose. Fig. 1 shows a piece of conduit in process of bending. The apparatus is arranged in a doorway so that the thrusts are taken by the sides of the stone wall. Wooden blocks are provided to prevent the piece of conduit from twisting, and to sustain it and the jack screw in correct relation.

The first step in forming a bend is to lay out on a floor a chalk-line curve of the contour which the complete conduit length is to assume. The line should represent the curve of the inner edge of the bend. The length of pipe may then be placed in position as indicated in Fig. 1 and pressure applied with the jack screw until it is bent a little. The conduit is then taken from the bending rig and compared with the guide line on the floor. Fig. 3 shows a bend on the floor being compared with a chalk guide line, represented in the drawing by the dotted line. After comparison the conduit is again placed in the bending rig and the process of applying pressure, removing and checking it with the index line is repeated until the bend is completed. It is evident that the process is essentially a cut-and-try one, and the only way to become proficient in making bends is through practice. Obviously it is best in forming a bend to start the bending at one end of the curve and gradually work around toward the other, comparing with the reference line as often as experience shows it to be necessary. An operator after a little practice will become skillful enough so that he will know just where to apply the bending pressure, and just about how much to bend the piece at each application. It is not necessary to utilize a doorway for the bending rig, since any other member of a building, such as a column, may be utilized, or a vertical stick of timber of generous proportions, substantially braced, may serve as a substitute. Fig. 1 illustrates the method, and it is not believed that further description would render the process clearer.

To transmit the pressure of the jacket to conduit lengths, a wooden bending form, shown in detail in Fig. 2, is necessary. It is essential to have in the face of the form which is applied to the conduit a half-round groove, for if a plain surface is applied it will probably flatten the conduit. The bending form should be made of hardwood, such as yellow pine or oak, and a yoke-shaped piece of wrought-iron plate should be secured to the form with through bolts. The yoke piece should be placed in such a position that it will take the brunt of the wear from the jack screw and distribute the pressure from it over a considerable surface of the wood. Referring to the detail of the bending form, the radius R_2 should be such that conduit of the size to be bent will fit in the groove. It is not absolutely necessary to have a separate form for each size of conduit, but as the danger of flattening is much less if the groove corresponds accurately to the outline of the conduit, the desirability of having separate forms is apparent. The radius R_1 should be the minimum to which a turn will ever be bent. In the table in Fig. 4 is given a schedule of radii of standard commercial conduit elbows, and because of the requirements imposed by practice it is not desirable to bend conduit to smaller radii than those tabulated. The dimensions C and F (Fig. 3) should each be about

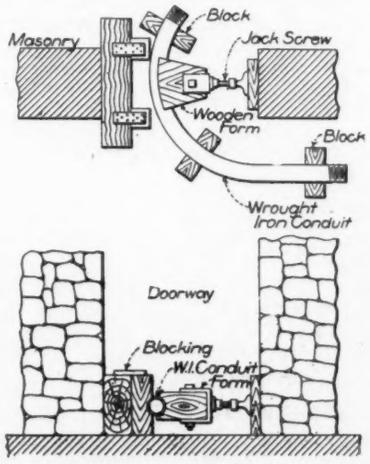


Fig. 1—Making a Bend in a Door.

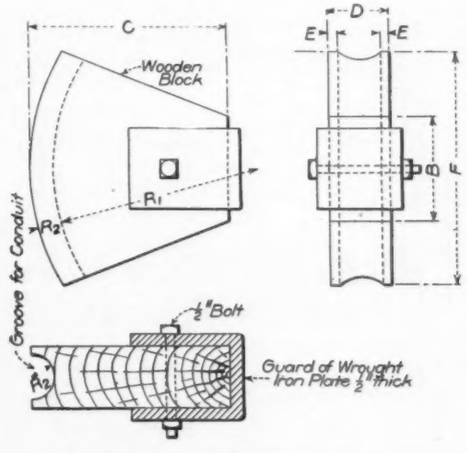


Fig. 2—Details of Bending Form.

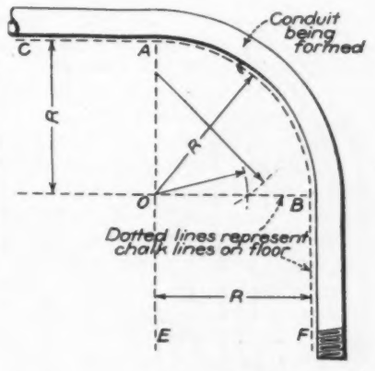
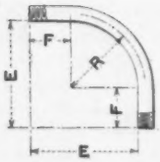


Fig. 3—Forming a Bend to a Chalk Line.

12 in. or 14 in.; the width *B* should be about 6 in. or 7 in., and the wrought-iron guard should be about 5 in. wide, and a bent of ½-in. plate to fit the block composing the form. At *E* the thickness should be in the neighborhood of ½ in.

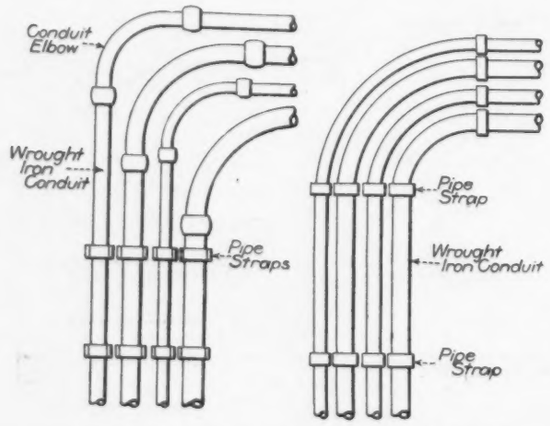
It is desirable when bending right-angle turns to be able to lay out with chalk lines on the floor an angle of 90 deg. This may easily be done without elaborate instruments by means of a piece of chalk and a string. Choosing any straight line for



Size Conduit	R Radius of Center Line	E Offset	F Length of Straight Portion	Weight of One Elbow Pounds	Prices each		
					List	50% off	70% off
½	4.25	7.50	2 3/8	.73	.22	.11	.07
¾	5.37	9.25	3 1/4	1.32	.27	.14	.09
1	5.75	10.12	4 3/8	2.00	.45	.23	.14
1¼	7.25	11.50	3 7/10	3.00	.70	.35	.21
1½	8.50	12.62	3 9/16	4.15	1.15	.58	.35
2	9.50	15.25	4 3/16	7.00	2.00	1.00	.60
2½	10.50	17.75	5 13/16	11.38	3.10	1.55	.93
3	13.00	19.37	4 3/8	18.85	9.00	4.50	2.70
3½	15.00	21.00	4	21.00	20.00	10.00	6.00
4	16.00	22.50	4½	21.60	22.95	11.48	6.89

Fig. 4—Properties of Commercial Elbows.

a base, and making this four units long (the units may be any dimension whatever), describe, by means of the string and chalk, an arc from one end of the base line having a radius three units long, and intersect this arc by an arc described from the other end of the base line having a radius five units long. Draw a straight line from the point of intersection of the two arcs to the two ends of the line and a right angle is formed. Geometry teaches that in a right-angle triangle the square of the longest side is equal to the sum of the squares of the other sides, so that remembering these numbers it is an easy matter to lay out a right angle. After a right angle has been laid out on the floor, the next step in laying out the guide line for a right-angle bend or elbow is to describe the arc *AB*, Fig. 3, with a radius *R* from the center *O*. The radius may be any length that conditions might demand, but it is best not to make it less than that tabulated in Fig. 4. The chalk line *CA* is drawn parallel with *OB* extended, and *BF* is drawn parallel with *OA* extended. The conduit is then bent to conform to the contour *CABF*. It should be noted that the Code provides that all elbows or bends must be so made that the conduit shall not



Figs. 5 and 6—Right Angle Turns with Elbows.

be injured, and that the radius of the curve of the inner edge of any elbow must not be less than 3½ in. It is not likely that this ruling will affect any conduit bend that must be made with a jack screw, inasmuch as the method is only necessary with the larger sizes of conduit, for which the radius at the bend must necessarily be great.

It was stated in the first paragraph that bends could be made economically by the method described. That this is true is evident from the table in Fig. 4, which gives the list prices of standard elbows and net prices and discounts of 50 per cent and 70 per cent. In small lots, to an infrequent buyer, a discount of 50 per cent from the list is frequently quoted. Carload lots can be obtained at a rebate corresponding to a flat discount of 70 per cent. Many other discounts intermediate between these are quoted to buyers of considerable, but less than carload, quantities. It will be noted that the price of elbows in 3-in., 3½-in. and 4-in. sizes is high, and it will be found that the labor cost of bending elbows with a jack screw is considerably less than the price with discounts deducted. Another point in favor of home-made elbows is that much neater work can be performed. This is well illustrated in Fig. 5, which shows right-angle turns in a run of four conduits of different sizes employing commercial elbows. The conduits are not parallel where they turn, and cannot be made so if commercial elbows are utilized. Even if each of the four conduits was of the same diameter a similar condition would obtain. Frequently the appearance of what would otherwise be a very sightly conduit installation is ruined by the use of commercial elbows in multiple runs at right-angle turns. The appearance of a right-angle turn in a run having elbows bent to an index line with a jack screw is shown in Fig. 6. Each conduit is parallel to its neighbor on the straight portion of the run and at the turn, and the aspect is neat and pleasing.

NEW TELEPHONE PATENTS.

TALKING-MACHINE TRANSMITTER.

A patent has been granted to Mr. J. J. Comer, of Baltimore, Md., for a multiplex transmitter designed to receive a mechanical vibration, which is to be reduced in amplitude and then impressed upon a telephone circuit. The inventor states that the amplitude of vibration received from a record may be about 40 times that allowable in a carbon transmitter. His transmitter consists of four microphone cells of the granular type mounted upon a plate to form a square. A rocker bar is arranged before them, pivoted on an axis parallel to two sides of the square, and between the buttons. Thus crossbars may be made to bear on the fronts of the buttons. As the rocker moves, the elements to the right are compressed, while those to the left are simultaneously relieved, and vice versa. This whole apparatus is mounted near the flexible point of support of a heavy inertia bar at the end of which is carried the stylus. This latter is so supported that its motions are transmitted by a reducing lever to an actuating bar which is in turn secured to the rocker.

PEG-COUNT SYSTEM.

For many years it has been the practice of telephone companies to periodically make a count of the calls handled upon some test day. This has been dubbed a peg count because formerly it was always made by means of pegs manipulated by the operators using the multiple before her as a score board. According to the invention of Mr. W. J. Kibbe, of Canandaigua, N. Y., an electromagnetic counter is used. This is terminated upon a metal bar at the operator's position. The circuits are then so arranged that a touch of the tip of any plug of a cord pair to the bar will cause a count upon the register. By this means a count can be accomplished with very little extra work.

IMPROVED SUBSTATION APPARATUS.

A new method of constructing and assembling a desk-stand set is described in a patent issued to Mr. C. D. Enochs and assigned by him to the Vote-Berger Company. This is of standard contour, the base being held to the tube by a rod projecting down through the tube from the headpiece and carrying on its bottom part a clamping nut. The switch springs are in the base of the set and are operated by a plunger, directly secured to the hook lever and lying parallel to the rod within the tube.

LETTER TO THE EDITOR.

Electricity in Agriculture.

To the Editor of Electrical World:

SIR:—The article entitled "Electricity on the Farm" appearing in your Jan. 6 issue, page 40, I have read with interest. The subject is there treated in a manner very similar to that employed by Mr. Kurt Krohne in some articles in the *Elektrotechnische Zeitschrift* in the autumn of 1908 and in my lecture before the Franklin Institute of that same year. A translation of Mr. Krohne's article having been suggested to me, I concluded that the ideas contained in these articles were not entirely applicable to agricultural conditions in this country and that to do the thing as it ought to be done the translation of the German articles should be used only as an historical review of what others have done, and, based on this, the subject should be developed along lines that are suitable for our American agricultural conditions. Otherwise, the lessons taught would be of little value.

As an example of the force of this it is easy for any one at all familiar with farming in this country to show that there is nothing to be gained by an $8,000 to $12,000 investment which only results in making it possible to obtain a power cost of $2 per acre. The present-day method of man and team costs only $2 per 1¼ acres. The interest and depreciation chargeable against the investment for the latter is much less, and if the farm is properly managed, the team is used as an actual producing agent, returning profit both in fertilizer and marketable young stock.

Since preparing my paper two years ago for the Franklin Institute, I have closely observed the American farming conditions and from publications on the subject and opinions of those of experience in this line I have obtained considerable data which have made it clear to me that in teaching these new ideas we must not go from one extreme to another.

There is to-day no good literature on this subject and the few articles which have been published preach lessons which would not always be safe to follow. The average farmer knows little of engineering, and the engineer is in a similar position regarding agriculture, and we will not make much progress until the two are united in one mind. The best teaching will, therefore, be along the line of good engineering applied to good farming.

NEW YORK. PUTNAM A. BATES.

Digest of Current Electrical Literature

ABSTRACTS OF THE IMPORTANT ARTICLES APPEARING IN THE ELECTRICAL PERIODICAL PRESS OF THE WORLD

Generators, Motors and Transformers.

High-Frequency Alternator.—J. BETHENOD.—In order to increase the number of sparks per second in wireless telegraphy and in order to obtain in the receiving telephone a strong sound—which can be clearly distinguished from parasitic sounds—the use of high-frequency alternators of special construction is necessary. The author gives the circular diagram of such alternators and points out its special features.—*La Lumière Elec.*, Dec. 25.

Lamps and Lighting.

Incandescent-Lamp Tester.—B. MONASCH.—In Germany "incandescent-lamp testers" have been introduced on a large scale. A great many of these are simply electrical measuring instruments, either ammeters or combined ammeters and voltmeters or wattmeters, without any photometric appliance. These testers have first been used successfully to demonstrate to the public the superiority of the metallic-filament lamp over the very old carbon-filament lamp. When they were used later for the comparison of different types of metallic-filament lamps they have led to very erroneous results. As a matter of fact, they open the way to fraud. The chief source of error is due to the fact that the candle-power of the lamp is not measured, but is simply read off from the mark on the lamp. In reality, however, lamps which are marked 16 cp have often a candle-power of 17 and 15, or even 18 and 13. In the latter case if the lamp has a specific consumption of 1.25 watt per candle-power, then the lamp tester will give a result of 1.405 watts or 1.02 watts per candle-power, when the candle-power is 18 or 13 instead of 16. Moreover, the practical conditions under which the testers are generally used are such that the voltage has not its normal value. Any variation of the voltage above or below the normal value will cause quite considerable mistakes in the specific consumption, as is shown by the author in tables.—*Elek. Zeit.*, Dec. 30.

Neon Lamp.—J. BLONDIN.—With reference to a recent paper of Claude on the industrial applications of oxygen and liquid air, the author refers to the neon luminescent type. Neon, which is obtained as a by-product in the manufacture of liquid air, has a considerable luminescent power. When a tube filled with neon and containing some drops of mercury is shaken, the neon assumes a beautiful red luminescence due to the electricity which is set free by friction of the mercury against the glass. On the basis of this observation Claude has constructed neon tubes which are operated by alternating currents of high tension like the Moore vacuum tube. The experiments have not yet been concluded, but are said to have given satisfactory results. One candle of light is produced by less than 1 watt.—*La Revue Elec.*, Nov. 30.

Generation, Transmission and Distribution.

Heat Transmission in Boilers.—W. E. DALBY.—A paper read before the (Brit.) Inst. Mech. Eng. The author reviews the work which has been done relating to the transmission of heat across boiler-heating surfaces. He first considers radiation and then conduction and convection, describing the effect of the gas and water films which coat a boiler plate. Notwithstanding the large number of researches and papers bearing on the subject of heat transmission, there is a general absence of complete data regarding the actual phenomena occurring in a steam boiler when working under the ordinary conditions of practice. No data exists, for instance, which gives the temperature gradients at different parts of a boiler flue with accuracy. The most important development of recent years has been in the gradual introduction and perfection of the water-tube type, but even in this modern product the essential features of the old types persist. This general absence of complete data is due to the inherent difficulties of the problem and to the enormous cost of carrying out complete experiments upon a large boiler under the ordinary working conditions. The author ventures to suggest, therefore, that the Institution might undertake a research in which steam boilers of different types working under practical conditions may be made the subject of experiments in which all the elements of their working are measured, together with temperature measurements for the purpose of establishing the temperature gradients at different parts of the heating surface. Such a research would be very costly, but would be well worthy of the Institution.—Lond. *Electrician*, Dec. 24.

Italian Water-Power Plant.—An illustrated description of the power plant of Verzasca which supplies electrical energy to the city of Lugano and neighborhood. It is equipped with six 1000-hp turbines and two 125-hp turbines. The former drive 4200-volt, 50-cycle, three-phase alternators; the latter two drive the exciters. Energy is transmitted at 25,000 volts over

a six-conductor line 15 miles in length to the transformer station at Massagno, near Lugano, where the e.m.f. is reduced to 3600 volts. Transformers within the city reduce the e.m.f. to 120 volts for distribution.—*La Revue Elec.*, Nov. 30.

Gas Producers.—Gwosdz.—An illustrated article giving brief descriptions of various new gas producers for bituminous coal. —*Glückauf*, Dec. 11.

Traction.

Hamburg.—Freund.—The conclusion of the long illustrated serial on single-phase operation on the Blankenese-Ohlsdorf-Hamburg Railroad, in Germany. In the present installment the arrangement of the trolley wire is described in detail. It is supplied with single-phase current at 5600 volts. In the car house and in the rail yard in Ohlsdorf the trolley wire is operated at only 300 volts.—*Elek. Zeit.*, Dec. 30.

Mountain Railway.—A. Soulier.—An illustrated description of the electric railway from Fayet to the Swiss frontier and to Martigny. Three-phase currents are used for transmission to substations, in which conversion is made to direct current at from 550 volts to 580 volts, at which e.m.f. energy is supplied to the third-rail. The multiple-unit system of Aubert is used. —*L'Industrie Elec.*, Dec. 25.

British Tramway System.—An abstract of last year's financial report of the municipal tramway system of Lincoln, which is the smallest of its kind in operation in England, the number of car-miles during the 12 months totaling 156,190. The number of passengers per car-mile was 9.71, the energy was 1.106 kw-hour per car-mile. The traffic expenses were 4.20 cents per car-mile, the general expenses 1.98, repairs and maintenance 2.26, energy expenses, 2.76, hence the total cost, without capital charges, 11.20 cents. Since the revenue from all sources was 18.76 cents and the capital charges 7.86, there was a deficit of 0.30 cent per car-mile.—Lond. *Electrician*, Dec. 24.

Point Controller.—J. P. Tierney.—A paper read before the Dublin Section of the (Brit.) Inst. Elec. Eng. The author describes the early forms and the present design of the Tierney-Malone point controller for electric tramways. This point controller can be adapted to trolley, conduit or surface-contact systems. He also refers to the modification necessary when trailer cars are extensively used during rush hours.—Lond. *Electrician*, Dec. 24.

Bow Contact Versus Trolley Rod.—Several letters from British tramway managers on the relative merits of the trolley rod and the bow conductor. Several of them speak strongly in favor of the bow.—Lond. *Elec. Eng'ing*, Dec. 23.

Installations, Systems and Appliances.

Direct-Current Boosters and Balancers.—W. A. Ker.—A paper illustrated by diagrams describing various systems of two-wire or three-wire boosters and balancers. One system is to use treble three-wire boosters, each booster having three generators—one in the positive, one in the negative and one in the neutral, the latter, of course, being electrically reversible. This system, which is shown in Fig. 1, when designed to compensate for the drop in the feeders, is quite stable and has the advantage that the potentials at the feeding points are natural potentials; that is, they are the same amount above and below earth as the busbar potentials. In addition, the load divides between the two boosters in inverse proportion to the resistance of the load from the feeding points. Another system of three-wire booster having only two generators is shown in Fig. 2. There is one generator in the positive, which is excited by two coils, one in the positive feeder, and the other in the negative feeder. The positive coil adds the voltage equivalent to the drop in the positive feeder, and the negative coil adds the drop in the negative feeder. The pressure across the outers at the feeding point is thus always kept constant. There is also a generator in the neutral of the feeder, which also has two exciting coils. One of these coils is the neutral coil, which adds, or subtracts, the drop in the neutral feeder. The other coil is a negative feeder coil, whose function is to raise the voltage of the neutral at the feeding point by the drop in the negative feeder. These negative coils are equalized as shown. So long as any out-of-balance current is on the positive side, and the other load is equally distributed, the voltage regulation is perfect; but as soon as an out-of-balance occurs on the negative side, or the load center is not central on the network—that is, as soon as the two negatives carry different currents—the voltage is slightly upset. All things considered, the system shown in Fig. 1, having three generators, one for each wire, is the most accurate and simple. An account of the discussion which followed the paper is also given.—Lond. *Elec. Eng'ing*, Dec. 23.

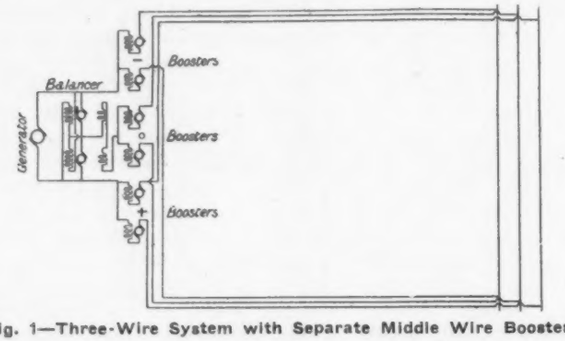


Fig. 1—Three-Wire System with Separate Middle Wire Boosters.

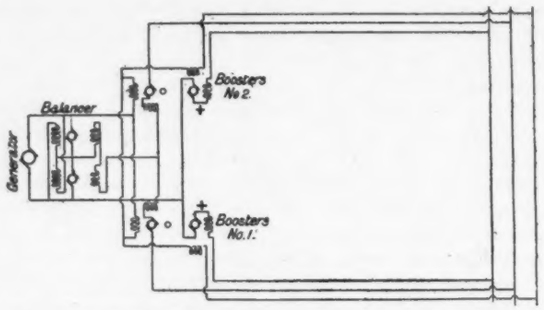


Fig. 2—Alternative Arrangement of Three-Wire Boosters.

Statistics of Austrian Central Stations.—L. Rosenbaum.—An article illustrated by diagrams in which the author compares the results of the statistics of the central stations of Austria with available statistics for Germany and reaches the following conclusions: The connections of incandescent lamps per capita are in general independent of the size of a city for cities with more than 10,000 inhabitants, but it is influenced by local conditions, especially by the presence of a gas plant. The connections of arc lamps are in general hardly 10 per cent of incandescent-lamp connections and depend otherwise on the same features. The ratio of energy used for lighting to the energy used for industrial purposes varies according to the local conditions; in large cities the connections for motors are generally more than the connections for lamps. The central-station equipment rating and the connections per 1000 inhabitants are in general independent of the size of the city. In general, a central-station rating of 25 kw per 1000 inhabitants may be assumed. The capital invested per kilowatt of central-station rating is, in general (for ratings above 100 kw), independent of the size of the city and varies mostly between $200 and $300.—*Elek. und Masch.* (Vienna), Dec. 26.

Cost of Producing Electrical Energy.—H. Bergmann.—A lecture giving a great many data on the cost of producing electrical energy to illustrate how commercial economy of a central station depends on its size and on the form of its load curve. It is all wrong to base an estimate of the cost of energy on the guarantees by the manufacturers of the machines. —*Elek. und Masch. Betriebe*, Nov. 5.

Switchboard.—R. M. Archer.—An illustrated description of an experimental switchboard for technical institutions to suit the large number of experiments required.—Lond. *Electrician*, Dec. 24.

Wires, Wiring and Conduits.

Regulation of Transmission Lines.—A. Blondel and C.

LEROY.—The conclusion of their illustrated serial in which they described a new graphical method for the calculation of the regulation of alternating-current transmission lines, taking into account the capacity and the leakage distributed along the line. Numerical examples are given and formulas for calculating the line are derived from the diagram.—*La Lumière Elec.*, Dec. 25.

Impregnated Poles.—An article illustrated by diagrams on the time required for impregnating fir wood. With long pieces,

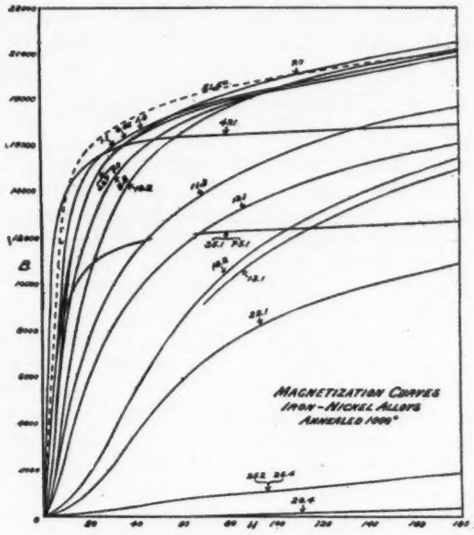


Fig. 3—Magnetization Curves.

such as used for poles, the impregnation fluid enters into the wood chiefly in the radial direction and saturation is obtained after seven or eight days.—*Elek. Zeit.*, Dec. 30.

Electrophysics and Magnetism.

Iron-Nickel Alloys.—C. F. BURGESS AND J. ASTON.—An illustrated article on the magnetic and electric properties of iron-nickel alloys. These were made from very pure materials so that the alloys contained practically nothing but electrolytic iron and nickel. Fig. 3 gives the magnetization curves for iron-nickel alloys annealed at 1000 deg. C. for varying proportions of nickel—marked on the different curves. For the purpose of comparison is given the dotted curve, which refers to pure electrolytic iron in the unannealed state, which is of very high magnetic quality. The strange feature of the nickel-iron series is that with these two highly magnetic materials one can obtain all degrees of magnetization, even to a non-magnetic range. Equally striking is the fact that these alloys in the non-magnetic range at normal temperatures become strongly magnetic at lower temperatures, which are dependent upon the composition. They remain magnetic upon a rise of temperature of several

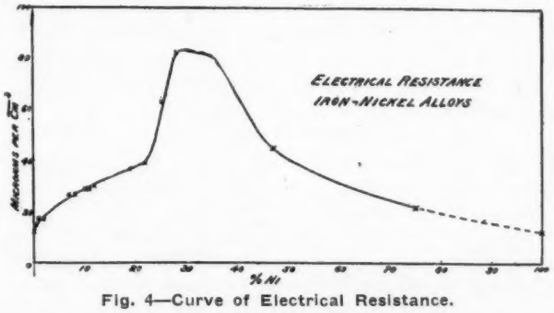


Fig. 4—Curve of Electrical Resistance.

hundred degrees, when they again become non-magnetic. The behavior is such that one might almost suppose that in the molecular arrangement of the alloys the iron and nickel become so oriented as to be of opposing polarity; this opposition becomes more pronounced with increase of the nickel content until finally a balance is reached with the resulting non-magnetic alloy. A further increase of nickel upsets this balance in favor of the nickel with its polarity preponderating. In the range of commercial usage, with from 2 per cent to 4 per cent of nickel, the magnetic properties of the alloys have not fallen off to such an extent as to obviate against the use of the nickel in case the resulting mechanical qualities required are of sufficient importance to warrant its selection. Some figures are given on hysteresis loss. This is a minimum for the 50 per cent nickel alloy. This alloy is, of course, out of the question for practical purposes. The authors finally give the results of measurements of electric resistivity. The results are shown in Fig. 4, in which the resistivity in microhms per centimeter cube is given as a function of the percentage of nickel. There is a gradual increase of resistivity with the increase of nickel up to a percentage of 22.11, where there is a sudden rise in the curve at compositions corresponding to those of the non-magnetic alloys. However, the curve continues to rise, reaching a maximum in the range between 28.42 per cent and 35.09 per cent. —*Met. and Chem. Eng'ing*, January.

Electrochemistry and Batteries.

Atoms and Molecules.—W. A. NOYES.—A theoretical lecture entitled molecular rearrangements. The author discusses especially three problems: first, the nature of the attractive forces between atoms; second, the question whether these forces are purely attractive, resembling gravitation, or polar, partly attractive and partly repulsive, resembling or identical with electrical forces, as is assumed in the ionic theory; third, the question of the nature of the forces which atoms already obtained with other atoms exert in the attraction or repulsion of still other atom groups.—*Jour. Amer. Chemical Soc.*, December.

Voltaic Cells.—E. H. LANDIS.—A theoretical paper discussing, first, the difference between the e.m.fs. and the potential difference of voltaic cells, and then explaining some general principles.—*Jour. Franklin Institute*, December.

Silundum.—R. AMBERG.—An account of the manufacture of silundum in a carborundum factory in Switzerland. They prepare amorphous carbon articles by pressing or by other treatment so that they get the desired form and then heat them in electric resistance furnaces of the simplest type, so as to subject them to the action of carborundum and sand, or carbon and sand, or to both actions together. The two reactions are $SiO_2 + 2\,SiC = 3\,Si + 2\,CO$ and $SiO_2 + 2\,C = Si + 2\,CO$. The silicon permeates into the carbon article and forms silundum. Silundum is useful as an electric conductor at high temperatures, for instance, for electric heating apparatus, etc. The resistivity of silundum is about six times that of carbon. The temperature coefficient of the resistivity is negative, but very small. At 100 deg. C silundum, according to its constitution, has a resistivity of one-half or two-thirds that at ordinary temperature. Silundum articles can withstand temperatures at 1600 deg. for a long time without crystallizing and for short periods even temperatures up to 1700 deg. Above 1700 deg. silicon evaporates, yielding a white vapor of SiO_2, while the carbon remains as graphite. Silundum can be heated to white heat and then immediately put into cold water without cracking. It is also proposed to treat coke in the same way and to use the coke which has been changed into silundum instead of ferrosilicon in steel works. Silundum has been used as an electrode in electrolytic processes, but experiments on its use as an anode in sodium chloride electrolysis have not yet been concluded. Air attacks silundum even at the highest temperatures only in so far as a film of SiO_2 is formed. This protects the internal parts.—*Zeit. f. Elektrochemie*, Oct. 1; abstrated in *Met. and Chem. Eng'ing*, January.

Electric Steel.—A. GRÖNWALL.—An article stating that if steel is made in the electric furnace from cold raw materials, the resulting product may be unhomogeneous if care is not taken to have a good circulation of the bath and to continue the treatment for a sufficiently long time. The electric furnace also requires workingmen who are familiar with its operation, and there is a great scarcity of such men. The author describes a new steel furnace of Swedish design for operation by two-phase currents. Circulation is here produced automatically by a rotary magnetic field.—*Met. and Chem. Eng'ing*, January.

Silicon.—S. A. Tucker.—An illustrated article describing a laboratory arc furnace for the preparation of silicon.—*Met. and Chem. Eng'ing*, January.

Units, Measurements and Instruments.

International Notation.—A long review of the article by Dr. A. E. Kennelly in *Electrical World*, Vol 54, 1909, page 374, on the question how far uniformity has already been obtained in international notation. The reviewer (K. S.) commends the work of Dr. Kennelly highly, but thinks that his system of notation is too narrow in so far as it appeals only to the electrical engineer. The mechanical and civil engineers should also be considered. In Kennelly's table there are no less than seven different symbols for mechanical force. The Committee on Units and Notations of the German Association of Electrical Engineers endeavors to devise a system of notations which can be internationally used, but its endeavors are directed in the first line toward uniformity of notation of all physical and engineering units in German-speaking countries, so that German mechanical engineers and civil engineers would use the same symbols as electrical engineers. It would be most desirable if all electrical engineers of different countries would use the same notations, but if this is to be attained they must also take into consideration the needs of the mechanical engineers and civil engineers.—*Elek. Zeit.*, Dec. 30.

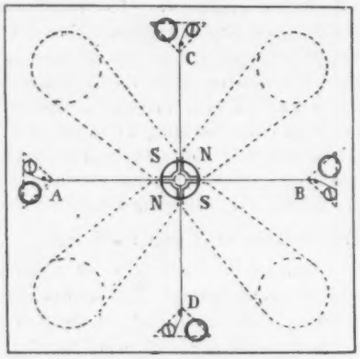


Fig. 5—Diagram of Phasograph.

Phasograph.—M. Siegbahn.—An illustrated description of a new instrument for studying alternating currents, called the phasograph. The apparatus, as shown in Figs. 5 and 6, contains two silver wires *AB* and *CD* perpendicular to each other (diameter 0.02 mm, length 10 cm), which are subjected to strong magnetic fields in the neighborhood of their crossing point. The four magnetic fields are produced by electromagnets with pole shoes of suitable form. The two silver wires are insulated from each other by means of a thin mica film. At the point where they cross is mounted a small mirror, which is, therefore, moveable in two planes perpendicular to each other.

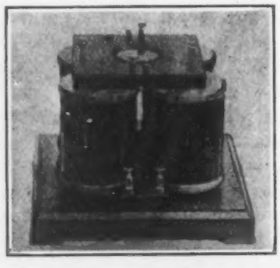


Fig. 6—View of Phasograph.

When the current passes through *AB* the mirror revolves around *CD*. When the current passes through both wires, the ratio of light reflected by the mirror projects a figure like the Lissajous figure of two tuning forks. In order to obtain the necessary dampening effects, the pole shoes and wires are placed in a brass box filled with castor oil. The tension of the wires can be regulated by screws. The apparatus may be used for demonstrating or for recording by means of photography. —*Phys. Zeit.*, Dec. 15.

Heavy-Current Resistors of Small Inductance.—E. Orlich. —An article on the use of heavy-current resistors for alternating-current testing at the Reichsanstalt. To reduce the inductance it is preferable to use thin strips instead of round wires. The theory of the construction of such resistors, as built at the Reichsanstalt, is given, especially with respect to heating and inductance, and the design of the resistors is described in detail. Such resistors made with thin strips have about one-eighth of the inductance of similar resistors made of round wire.—Lond. *Electrician*, Dec. 24.

Telegraphy, Telephony and Signals.

Wireless Telegraphy.—J. A. Fleming.—The conclusion of his illustrated paper on some quantitative measurements in connection with radio telegraphy. In the present installment the use of a spark counter to photograph the oscillatory spark at the spark balls of a wireless telegraph transmitter is described and a number of records are reproduced which reveal the processes actually taking place in the spark gap of a radiotelegraphic transmitter. The measurement of wave-length and logarithmic decrement of the oscillations are also discussed, and in conclusion reference is made to the measurement of the overall efficiency of a transmitter. The following power balance sheet is given for a wireless telegraph transmitter, the power given to the rotary transmitter in direct current being 2620 watts:

	Watts.
Rotary losses	1,139
Line losses	71
Choker losses	610
Transformer losses	355
Oscillation circuit losses in condenser, spark-gap and inductance	351
Antenna resistance losses	16
Balance (power radiated as electromagnetic waves)	78
	2,620

Only 78 out of the 2620 watts, therefore, represent power radiated in form of electromagnetic waves.—Lond. *Electrician*, Dec. 24.

Phototelegraphy.—T. Thorne Baker.—A paper presented before the Royal Society of Arts in London describing the author's process of phototelegraphy in which a Caselli transmitter is employed. The half-tone photographs are printed in fish glue upon lead foil, and the lines are pressed into the soft metal, so that there is no friction at the style. The receiver is very simple, and is in appearance the facsimile of the transmitter. A piece of chemically prepared paper is wrapped round the (metal) cylinder and the current received is passed through the style into the cylinder by way of the paper. Every time current flows, a chemical mark appears on the paper by electrolytic action, as in the Bakewell telautograph. The paper is sufficiently sensitive to record 500 or 600 dots a second, while the receiver is fitted with simple regulating gear by means of which the distortion of the currents caused by their passage through a long-distance line can be completely overcome. The arrangement is seen in Fig. 7. At the sending station there are a metal drum revolving and a style traveling laterally so as to trace a spiral path across it; a single line half-tone photograph is wrapped round the drums, and the lines in the picture act, therefore, as interrupters of the current sent into the telephone lines. At the receiving end, the style feeds the paper with current, decomposition is effected, and a dot appears each time the sending style comes in contact with the lead foil—

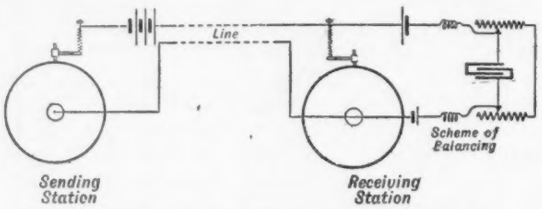


Fig. 7—Diagram of Photo-Telegraph System.

that is, when it is between the two lines. A weaker current also flows through the style and drum in the opposite direction. The battery used to supply this current is divided into two components. In series with each is an inductor of adjustable inductance with soft iron core and a resistor of adjustable resistance, one end of each resistor being joined; one terminal of each battery goes to the receiver, so that the whole arrangement acts as a shunt on it, or on the line. Between the sliding contacts of the resistor is a condenser of variable capacity. A wireless arrangement for transmitting pictures and an investigation of the effects of capacity are also discussed.—Lond. *Electrician*, Dec. 24.

Wireless Telephony.—CONLIN.—The first part of a paper read before the International Society of Electricians in Paris on wireless telephony. The present installment gives a historical review.—*Jour. Teleg.*, Dec. 25.

Miscellaneous.

Welding.—E. LAMBERTON.—An illustrated article discussing various methods of welding for the repair of castings. The author describes the old ordinary method of welding by fusion, electric welding, thermit welding, and oxyacetylene and oxy-hydrogen welding. All of these methods have their field of usefulness. The weak point of the electric arc welding method is that it requires electricity supply and, therefore, cannot be carried out everywhere. However, it yields an especially strong weld. The cost of operation of the different methods seems to be about the same, although the cost of first installation is different.—*Stahl und Eisen*, Dec. 29.

New Apparatus and Appliances

EDISON NICKEL-IRON STORAGE BATTERY.

In a paper read before the A. I. E. E. on May 21, 1901, Dr. A. E. Kennelly announced Mr. Thomas A. Edison's invention of a comparatively light and extremely durable storage battery whose characteristics made it especially suitable for automobile work. A few years after the battery appeared on the market, and the claims made for it of high watt-hour capacity per unit of weight and ability to withstand high rates of discharge and charge substantiated. In general appearance the cell combined elegance of design and finish, with a most solid and enduring mechanical construction, and at the time of its appearance represented an undeniable progress in electric automobilism. The industry was, therefore, not a little surprised when the battery was withdrawn from the market a number of years ago because Mr. Edison felt it was not as it should be and that he could improve it materially.

The Edison Storage Battery Company, of Orange, N. J., announces the completion of the new cell, which is now being placed on the market. In outward appearance it does not differ except in minor details from the original cell, but the structure of the positive plate has been radically modified and other improvements embodied which greatly increase the capacity and durability.

The general make-up of the cell is clearly shown in the accompanying engravings which, supplemented by the following brief description, should suffice to give a clear impression of the mechanical features of the Edison battery. At present the battery is made in two sizes; one size having four positive and five negative plates, and the other possessing six positive and seven negative plates. The active material in the positive plate consists of nickel oxide and iron oxide is used in the negative electrode. The electrolyte consists of potassium hydrate (21 per cent solution) to which has been added a small amount of lithium hydrate. The function of the lithium hydrate is not clearly defined, but it has been found to improve the working of the positive electrode. The normal specific gravity of the solution is 1.210, which does not change during charge or discharge. The efficiency and capacity of the cell, however, are not affected to any extent if the specific gravity of the solution is as low as 1.160. Below this a temporary effect is noticeable in the output of the cell.

The retaining cans are made of electroplated steel welded at the seams by the autogenous method—that is, by the application of the oxyacetylene blow-pipe. The walls of the can are corrugated so as to obtain the greatest amount of strength with minimum weight. The iron element has an excess capacity over the nickel element, and does not differ from the iron electrode formerly used except that the process of making the active material and the method of loading it into the containers have been improved. Much time has been spent in perfecting the nickel element. The former positive plate was made up of flat rectangular pockets containing nickel oxide and graphite. It was found that the graphite oxidized and that mechanically the structure could not resist the swelling action of the nickel oxide. In the new plate round tubes 4 in. long and about the diameter of an ordinary pencil are used to retain the nickel oxide. The tube is made of thin perforated steel, which, when filled with the active material and properly bound by eight steel rings, makes expansion of the active material impossible and insures perfect internal contact. Instead of the graphite formerly employed, electrochemically prepared flakes of pure nickel are interspersed in the oxide to increase the conductivity of the active mass, because nickel oxide of itself is a poor conductor. Each positive plate consists of a grid of nickel-

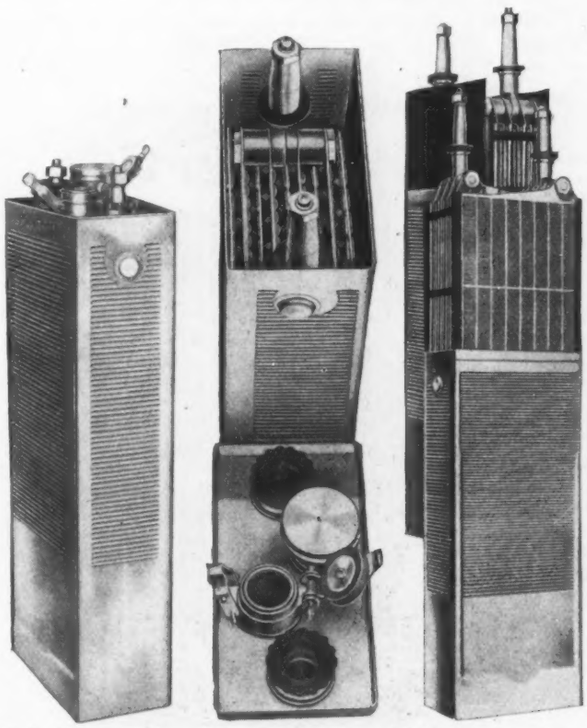


Fig. 1—Edison Battery. Fig. 2—Top View of Cell With Cover Removed. Fig. 3—Cell With Electrodes Partly Lifted.

plated steel holding 30 of these tubes. The negative plate comprises 24 flat rectangular pockets supported in three horizontal rows in a nickel-plated grid. The pockets are made of thin nickel-plated steel perforated with fine holes, each pocket being filled with an oxide of iron and afterward subjected to very heavy pressure.

The plates of each group are hung on a connecting rod per-

pendicular to, but integral, with the pole. They are held apart by nickel-plated steel washers and held firmly in contact by nuts screwed on both ends. The two outside plates are negative and are insulated from the retaining can by sheets of hard rubber. Hard-rubber pieces are also fixed between the can and the side and bottom edges of the plates, and these, together with the hard-rubber rods inserted between the plates, maintain correct spacing and insure permanent insulation.

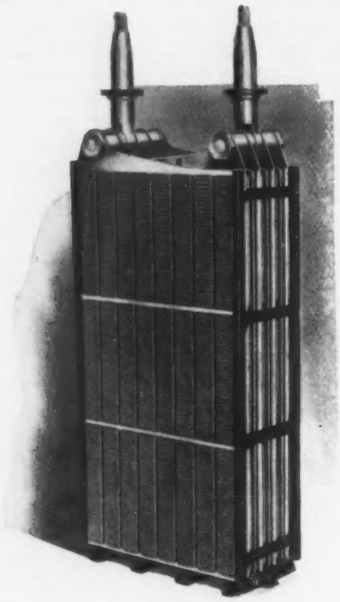


Fig. 4—Assembled Plates of Edison Battery.

The cover of the cell, which is also welded in place, has four mountings. Two of these are for stuffing boxes through which

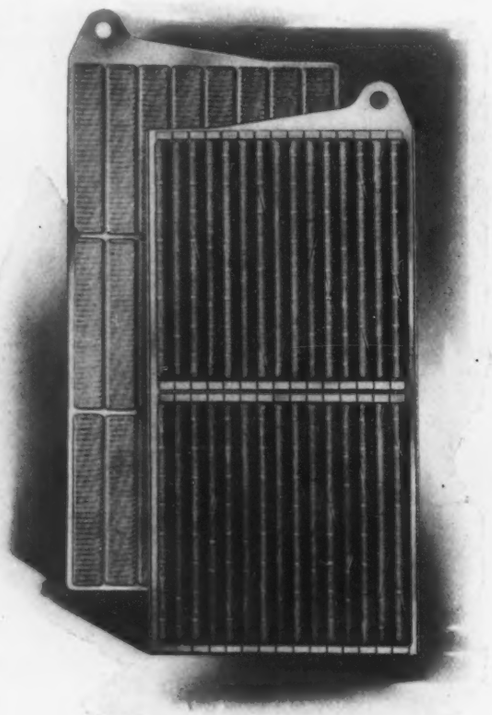


Fig. 5—Positive and Negative Plates.

the positive and negative poles extend; one is a separator which prevents the loss of electrolyte while allowing the gases to escape and the other is an opening for water and electrolyte. This opening is fitted with a water-tight cap held in place by a catch. Fastened to the cap is a spring so arranged that the cap will fly open unless properly fastened. In an assembled battery each individual cell is held securely in place and from contact with adjacent cells by means of small

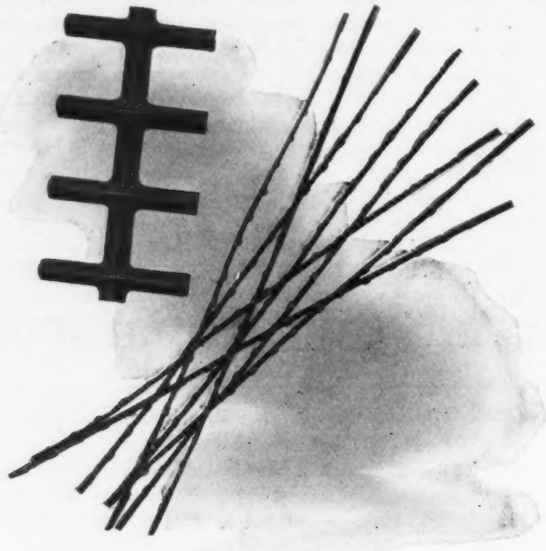


Fig. 6—Portions of Vulcanized Rubber Insulation.

hard-rubber button which extends through the slat on each side of the tray and fits over an emboss pressed out on the side of the can. The bottoms of the cells are held in position by small buttons protruding from a conveniently arranged wooden block fastened to the bottom slats of the tray. The

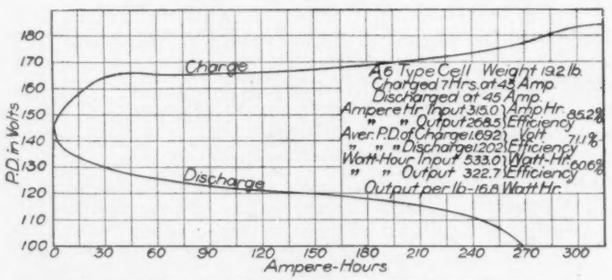

Charge
Discharge
A6 Type Cell Weight 19.2 lb.
Charged 7 Hrs. at 45 Amp.
Discharged at 45 Amp.
Ampere Hr. Input 315.0 Amp Hr. 85.2%
" " Output 268.5 Efficiency
Aver. P.D. of Charge 1.692 Volt 71.1%
" " " Discharge 1.202 Efficiency
Watt Hour Input 533.0 Watt-Hr. 60.6%
" " Output 322.7 Efficiency
Output per lb. 16.8 Watt Hr.
P.D. in Volts
Ampere-Hours

Fig. 7—Characteristic Charge and Discharge Curves.

indentations in the bottom of the cell fit over these buttons. A rubber apron insulates the cell from the block.

The separator through which the gases escape while the battery is charging is designed in such a way that these escape in a substantially dry condition, the globules of liquid coalescing with a liquid film which forms at the base of the casing and seat of the ball valve with which the battery is fitted, and in this way falling back into the cell. The electrolyte,

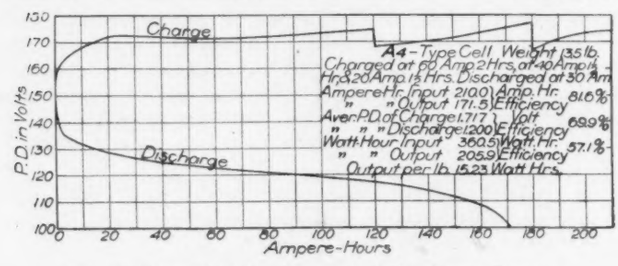

Charge
Discharge
A4 Type Cell Weight 13.5 lb.
Charged at 60 Amp. 2 Hrs. at 40 Amp. 4 Hrs. 20 Amp. 1.5 Hrs. Discharged at 30 Amp.
Ampere Hr. Input 210.0 Amp. Hr. 81.6%
" " Output 171.5 Efficiency
Aver. P.D. of Charge 1.717 Volt 69.9%
" " " Discharge 1.200 Efficiency
Watt Hour Input 360.5 Watt. Hr. 57.1%
" " Output 205.9 Efficiency
Output per lb. 15.23 Watt Hrs.
P.D. in Volts
Ampere-Hours

Fig. 8—Characteristic Charge and Discharge Curves.

therefore, need only be replenished with distilled water until completely changed every 8 or 10 months.

Electrical connections between the cells is made by means of heavy copper connectors, well plated with nickel. The lugs at the end fit over taper-joint binding posts and are held in place

with a nut. A socket wrench for removing the nuts which hold down the connectors and a specially designed jack for lifting the lugs from the binding posts when disconnecting the cells are sent with each battery. The trays in which the cells are assembled are very light, and where formerly the ends and the bottom were dovetailed together, the trays are now made of continuous strips, the corners being bent. The data of the cells are given herewith:

	Type A-4.	Type A-6.
Rated ampere-hour output	150	225
Average discharge voltage per cell	1.2	1.2
Normal rates of charge and discharge in amperes	30	45
Weights (in pounds) of cell complete	13.5	19.2
Width of can	2 9/16	3 3/4
Breadth of can	5	5
Height of can	13 3/8	12 3/8
Height of cell to top of pole (not assembled)	13 3/8	13 3/8
Required height of battery compartment	15	15

While the normal rate of charge of the smaller cell, for instance, is 30 amp, charging may be done at double this rate for a one-hour boost if the temperature is kept from rising much above 100 deg. Fahr. It is also permissible, though not recommended, to discharge a battery continuously at rates up to 25 per cent above normal, and for occasional short intervals of time as in hill climbing or starting on heavy roads, no harm is said to result if the rate be increased to three or four times normal. It

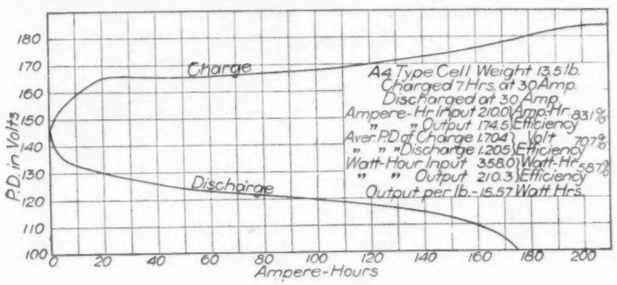

Charge
Discharge
A4 Type Cell Weight 13.5 lb.
Charged 7 Hrs. at 30 Amp.
Discharged at 30 Amp.
Ampere-Hr. Input 210.0 Amp-Hr. 83.1%
" " Output 174.5 Efficiency
Aver. P.D. of Charge 1.704 Volt 70.7%
" " " Discharge 1.205 Efficiency
Watt-Hour Input 358.0 Watt-Hr. 58.7%
" " Output 210.3 Efficiency
Output per lb. - 15.57 Watt Hrs.
P.D. in Volts
Ampere-Hours

Fig. 9—Characteristic Charge and Discharge Curves.

will be seen from the accompanying curves that the capacity of the Edison battery increases after it has been placed in service so that after working some time the efficiency is increased and greater output obtains also. This process of self-forming continues over a period of from one to three months of regular service and it is partly to assist in this forming up that the overcharges are recommended at intervals. The curves also show that the battery possesses reserve capacity. The highest practical limit of output is reached when a battery is charged 10

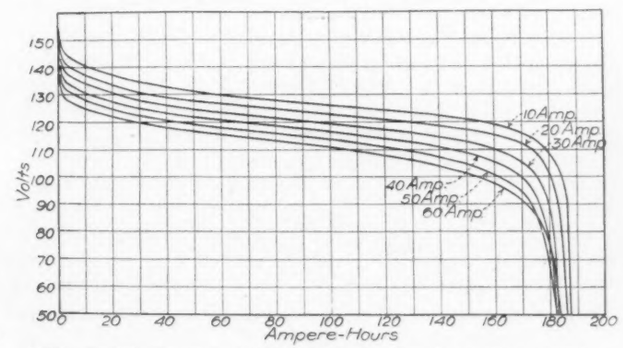


Fig. 10—Discharges at Different Rates and Constant Charge.

hours at the normal rate, and its value will be, for a fully formed battery, perhaps 30 per cent more than the rated output. Efficiency is sacrificed somewhat, of course, when the highest available capacity of the battery is utilized. A seven-hour charge at normal rate is considered a normal charge.

It has been found in testing the battery under severe conditions that with a rated discharge three times normal the voltage drops 0.03 volt for every 10 amp increase. On returning to normal discharge the voltage comes up to a value a trifle higher than normal owing to the heat generated at the heavy discharge rate. Heat on discharge increases the output while heat on charge diminishes it; but excessive heating at all times impairs the life of the battery and should be avoided. The watt-hour efficiency of the cell is given in various curves and ranges from 60 per cent to 65 per cent. The smaller battery gives about 14 watt-hours per pound of cell, and the larger cell 16 watt-hours. The manufacturer lays stress on the claims that the battery cannot be injured by overcharging; it does not deteriorate when left discharged; any cell can be removed by simply detaching the connections from the poles, and the battery has nearly twice the output or mileage of other batteries weight for weight. The purity of the chemicals used and the structure of the cell insure great durability and long life.

FLEXIBLE TRANSMISSION LINE TOWERS.

A departure from the wind-mill type of construction for steel transmission-line towers is indicated in the accompanying illustrations. These towers are rigid for stresses perpendicular to the line, but have a certain amount of flexibility in the direction of the line. Thus they possess all of the strength required in normal service, and in case of a break in the line each tower bends forward somewhat and thereby relieves the strain so that the towers cannot be pulled over in succession.

The towers herewith illustrated are built up of 5-in. channels of 6.5-lb. material, laced in pairs 12 in. back to back. The

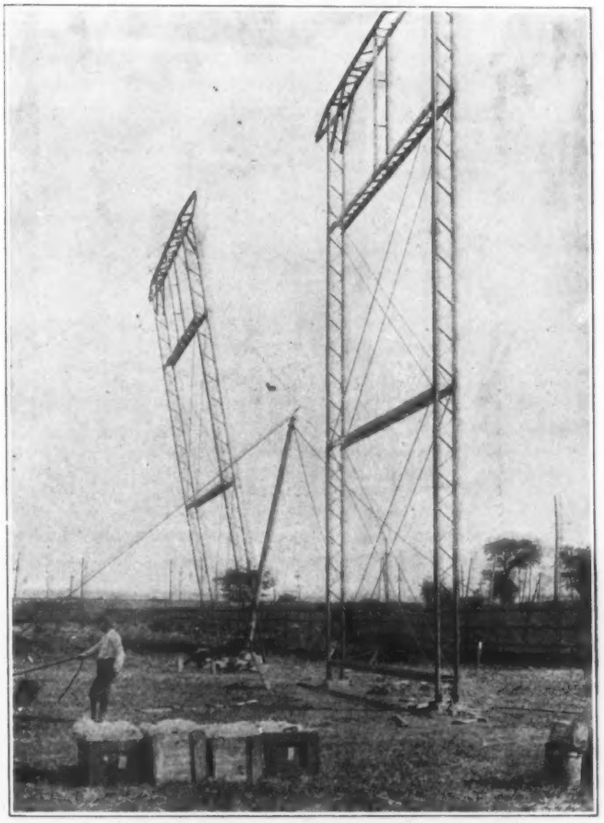


Fig. 1—Tower During Erection.

lacing is of 2-in. x 3/16-in. bar. This construction is used for both vertical and horizontal members. The columns are placed 19.5 ft. from center to center. Diagonal rods 5/8 in. in diameter serve to brace the structure and give it rigidity in the proper direction. The cross-arm has an over-all length of 30 ft. and is supported 43 ft. from the foundation.

In addition to the advantages of rigidity where required and flexibility where desired, the towers are said to cost only about one-half as much as towers of former types. A considerable saving is effected by reason of the fact that all of the vertical supports and horizontal beams are shipped from the factory in

their completed form, the amount of field work having been reduced to the minimum. After the parts have been bolted together, the tower, as a whole, is quickly raised to position by

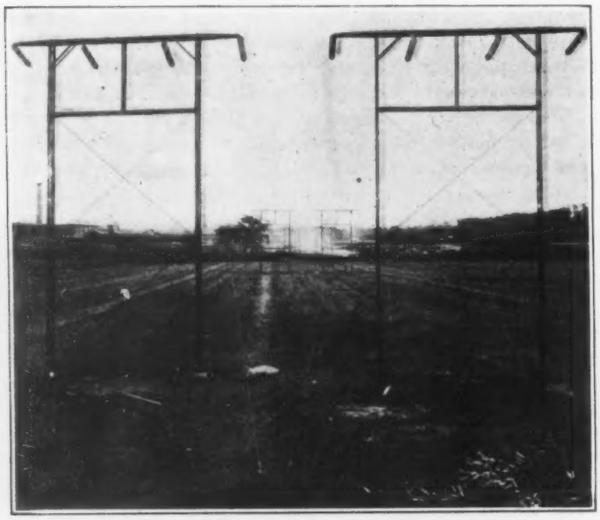


Fig. 2—End View of Transmission Line.

tripping about a trunnion, as shown in Fig. 1, bolted in place on the concrete foundation and anchored as may be desired. Figs. 2 and 3 show two lines of these towers erected near the

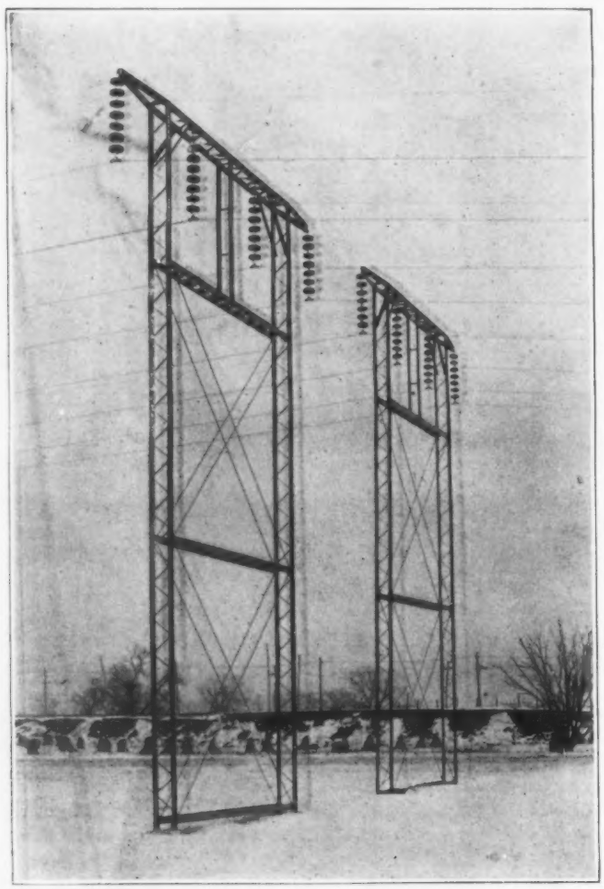


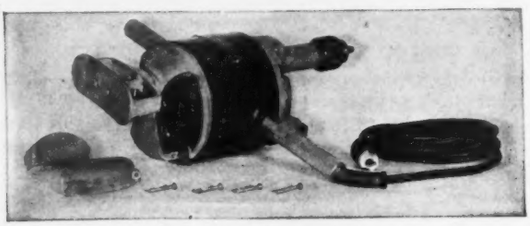
Fig. 3—Partial Side View of Tower Line.

factory of the General Electric Company, at Schenectady, N. Y. This installation has been made for the purpose of conducting experiments with e.m.fs. reaching as high as 200,000 volts. From Fig. 3 it will be seen that an excellent location is provided for the overhead grounded wires, which are fastened directly to the top beam on the towers.

The above-described towers were designed and built by the Archbold-Brady Company, Syracuse, N. Y.

ALTERNATING-CURRENT PORTABLE DRILL.

The portable breast drill illustrated herewith is designed for operation from an alternating-current circuit. The motor is a 60-cycle machine wound for either 110 volts or 220 volts, as may be desired. An indicating control switch for starting and stopping the motor is so located that it can be operated by the right hand without releasing hold on the handle. This feature makes control of the apparatus so simple that the whole attention may be given to the operation of the drill. Handholes furnish a



Alternating Current Portable Drill.

means of easy access to the commutator and brushes for inspection and repairs if necessary.

The tool is fitted with a jacob's chuck which will take drills up to and including ⅜ in. in diameter. An idea of the great saving of time made possible by its use may be gained from the following approximate data: It will drill a ⅜-in. hole 1 in. deep in cast iron in 27 seconds; in machine steel in 95 seconds. It will also satisfactorily operate a ¾-in. wood bit. Compare this time with the time required to move heavy castings to a stationary drill, adjust them, drill one hole, adjust again, drill another, etc. In general, a crane will be required necessitating the services of several men in addition to the one operating the drill. In many cases the same work could be done in a few minutes by one person with a portable drill.

The tool complete weighs 21 lb. It is said that it can be handled by one person with great ease and rapidity. It has been placed on the market by the General Electric Company, Schenectady, N. Y.

TUNGSTEN LAMP FIXTURE.

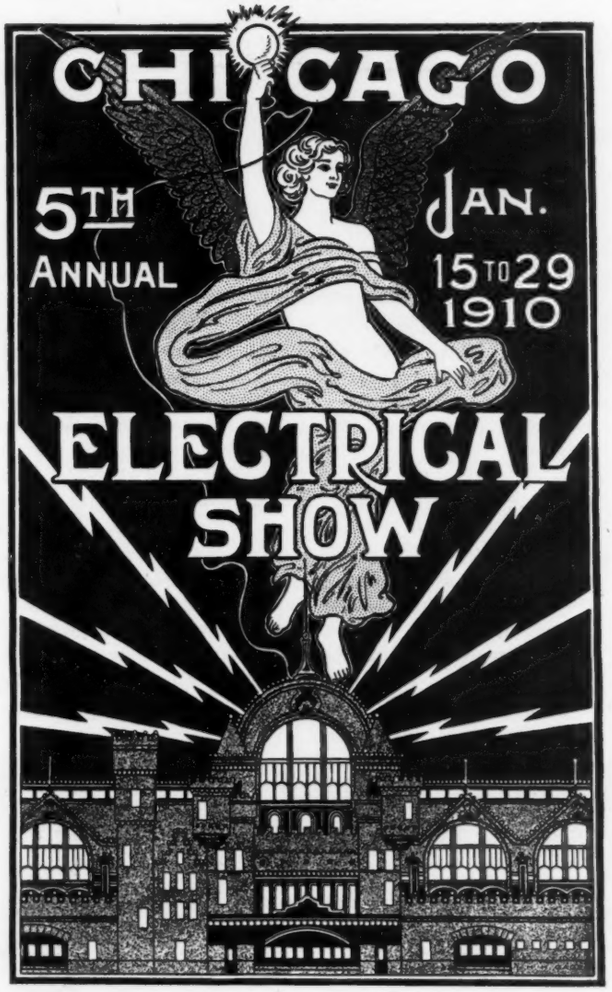
The Benjamin Electric Manufacturing Company, of Chicago, Ill., has added to its already large list of electric fixtures one especially adapted for factory, shop and warehouse service and intended for use in connection with tungsten lamps. The features of the fixture, which is illustrated by the accompanying engraving, are a 20-in. porcelain enameled steel shade, an 8-in. stem of ½-in. pipe and a shock absorber. Tungsten lamps

Tungsten Lamp Fixture.

rated at 40 watts, 60 watts or 100 watts may be used, and in the three-lamp and four-lamp fixtures the lamps hang vertically, while in the five-lamp and six-lamp fixtures they are suspended at an angle of 15 deg.

CHICAGO ELECTRICAL SHOW.

EXHIBITS AT CHICAGO ELECTRICAL TRADE EXPOSITION.



ELSEWHERE is a general account of the Chicago Electrical Show, which was opened at the Coliseum on Jan. 15 and will continue until Jan. 29. Herewith are presented brief accounts of the several exhibits, of which there are about 100, with the exception of the central-station display of the Commonwealth Edison Company, which is treated in the general article. Nearly all of the smaller appliances used in electrical work are shown, including dynamos and motors, wires, conduit and wiring specialties, Mazda and other incandescent lamps, flaming arcs and other arc lamps, electric signs, switchboards, transformers, electric fans and pumps, electric automobiles and automobile garages, electrically heated and electrically operated tools, electric heating and cooking appliances, vacuum cleaners, telephones, electrical glassware, storage batteries, carbon products, photometers, "wireless" apparatus, rectifiers, vibrators and a large number of other classes of apparatus, including a model of a steam turbine and electrically heated garments. Accounts of the various exhibits, arranged alphabetically by the name of the exhibitor, follow:

Acme Wire Company, New Haven, Conn., makes a special feature of automatic machine-wound field coils. By its new method of winding field coils automatically, the company says that it is able to produce a coil which is superior to hand-wound coils. It guarantees that these coils will not vary in weight more than an ounce. This is regardless of the size or number of layers or turns and whether round or rectangular in shape. Samples of solenoids for all kinds of electrical control, as well as railroad signal coils and coils for wattmeters, telephones, etc., are shown. The new magnet wires known as Enamelite, Silkenite and Cottonite are displayed. Messrs. P. C. Ackerman, E. L. Hartpence and W. H. Balke represent the company.

Allis-Chalmers Company, Milwaukee, has an attractively arranged machinery exhibit. It includes a 30-hp polyphase induction motor and a portable air compressor of 11 cu. ft. capacity driven by a 115-volt, 60-cycle, three-phase, alternating current motor. A model of the Allis-Chalmers horizontal steam turbine is shown and also four transformers, one rated at 50 kva, one at 20 kva, one at 5 kva and one at 2 kva. The transformers shown are of the lighting type and are oil insulated, designed for operation on primary circuits of from 1050 to 2100 volts. They are intended for a normal frequency of 60 cycles, but can be operated on any frequency from 50 to 140 cycles, the efficiency being somewhat better on the higher frequency than on the lower one. While the exhibit is placed in charge of Mr. F. G. Bolles, the company is also represented at the exhibition by Messrs. J. W. Gardner, Chas. M. Howe, S. R. Kerr, C. S. Buell, A. W. Catlin, K. D. Chadbourne, J. M. Denniston, Ervin Dryer, R. H. Gaither, C. M. McDonald, C. M. Nicholson, J. C. Orrell, L. St. John Smith, F. von Schlegell and E. W. Linquist.

American Gum Tape Company, New York, exhibits gum tape used for sealing packages of all kinds without the use of twine. A number of small machines for holding and moistening the tape are shown in the exhibit. Messrs. F. E. Francis and E. E. Dutcher represent the company.

American Ironing Machine Company, Chicago, has on exhibition ironing machines which are not only electrically driven but electrically heated. Three machines—the small family size, the large family size and the hotel machine—are shown in operation and deft lady demonstrators illustrate how the machines are used in practice. Messrs. H. G. Grosse and G. A. Renner represent the company.

American School of Correspondence, Chicago, exhibits its line of text-books used in school work and its encyclopedias, of which some 13 are published. Messrs. M. L. Brantingham, O. C. Miller and A. R. Hodge represent the school.

American Sign Company, Kalamazoo, Mich., exhibits an American lens electric sign containing an American beauty flasher with four-color effect. The assertion is made that this type of sign can be read at a much longer distance than the all-lamp sign of the ordinary type, while it is said to consume only about one-fifth the usual amount of electric energy used for illuminating a sign of corresponding size. Mr. George D. Bailey represents the company.

American Steel & Wire Company, Chicago, has a centrally located exhibit of its "Crown" and "United States" rail bonds and machines for applying these bonds. Rubber-covered wires and cables, weatherproof wire, lead-encased cables, trolley wire, lamp cord, telephone and telegraph wires and miscellaneous wires of varied description are also shown in an attractive and conspicuous display. The exhibit also includes wire railroad fencing. Messrs. C. S. Knight, Jr., R. W. Van Pelt, E. L. Angle, H. S. Durant, R. C. Moeller, F. J. Conkling and C. R. Sturdevant represent the company.

American Telephone & Telegraph Company gives a working demonstration of long-distance telephone toll service in connection with the exhibit of the Chicago Telephone Company. The exhibits of this company, the Western Electric Company and the Chicago Telephone Company are contiguous and are inter-related to some extent. Messrs. W. E. Bell and Albert Douglas represent the company.

Appleton Electric Company, Chicago, exhibits its new no-thread outlet boxes, Unilets and other conduit fittings. Messrs. A. I. Appleton and R. P. Tillotson represent the company.

Automatic Press Company, Chicago, displays a small electrically operated automatic card-printing machine, which is shown in operation. Mr. F. W. Kohl represents the company.

Bishop & Babcock Company, Chicago, shows its interesting "Eureka" automatic electric water lifts for elevating soft water from cisterns and supplying it throughout buildings. Two machines are shown having capacities of 300 and 150 gal. per hour respectively. The company also exhibits "Eureka" automatic air compressors, one of which is designed particularly for inflating automobiles tires maintaining automatically a constant pressure of 100 lb. or less. The pump of this compressor is back-geared to the motor and is made entirely of bronze. Messrs. Cooper Lyon, H. G. Kastilahn, R. H. Michalis and A. H. Lewis represent the company.

Chicago Fuse Wire & Manufacturing Company, Chicago, has on exhibition some particularly fine display boards especially prepared for the show, on which are exhibited a representative line of the company's conduit outlet boxes, covers and switch boxes, also enclosed fuses and blocks, fuse wire and fuse links, all sold under the trade name "Union." Mr. Arthur S. Merrill has charge of the exhibit, while Messrs. W. W. Merrill, George C. Reid, Walter D. Dana, Joseph Pearson, G. E. Harland, Clarence T. McDonald and Milton Mill also represent the company.

Chicago Pneumatic Tool Company, Chicago, displays a complete line of portable electric drills, grinders and hoists, as well as portable pneumatic tools, consisting of hammers, drills, etc. Messrs. C. B. Coates, Edward Aplin, Chas. H. Schumacher, Paul Jahn and L. H. Conover represent the company.

Chicago Telephone Company, Chicago, has a working demonstration of its telephone exchange service. Apparatus is shown as it appears in actual service. The largest size multiple switchboard for subscribers' lines now built by the Western Electric Company is installed in two sections and six operators with supervisors, chief operator, etc., are at work just as in the company's exchange offices. The lighting of the miniature call lamps, the answering of calls by operators and the completing of connections in the multiple sections are practically demonstrated in full view of all spectators. In addition to this, there is a practical demonstration of long-distance toll service from sound-proof booths. Free service will be rendered to many points outside of the city. This conspicuous working exhibit is in charge of Messrs. A. M. Ramsay, N. Anderson and O. W. Stitt.

Collins Wireless Telephone Company, Newark, N. J., exhibits and explains its wireless telephone and high-frequency apparatus. The showing includes the Collins wireless telephone and the Collins-Sanchez portable high-frequency apparatus for the use of doctors and surgeons.

Como Electrical Company, Spring Lake, N. J., has on exhibit the Hickley alternating-current rectifier for charging automobile storage batteries or other purposes where a rectifier may be used. The rectifier is of the electrolytic type and with its accompanying switchboard panel is compactly and ingeniously arranged. It is said that the chemical solution and the electrodes of this class of rectifier will last for 12 months under normal conditions. Messrs. Robert Boone and A. S. Hickley represent the company.

Consolidated Electric Appliance Company, San Francisco, has an interesting and novel exhibit in the line of electric heating and cooking appliances. This company shows its instantaneous electric bath, basin, tank and dental heaters. No wire whatever is used in the heating element and the capacity of the heaters is from 1 qt. to 4 gal. of boiling water a

Fig. 1—General View of Chicago Electrical Show, Showing Decorative Lighting Effect by Six Searchlights Playing on Tinsel and Ribbon Streamers from Roof.

minute; the water is turned into steam in a few seconds. The "Pluto" portable bar heater is also a novelty. It can be attached to an ordinary lighting circuit and enables one to draw boiling water almost at once. Barbers' urns, electric flatirons, heating disks, curling iron heaters and other devices of this character are included in the exhibit. Mr. George B. Katzenstein, Jr., represents the company.

Crane Company, Chicago, has an exhibit of motor-operated cast-steel gate valves, as well as high-pressure gate valves of ferro steel, and a working exhibit of "Cranetilt" steam traps. There is also a cast-steel header 7 ft. 6 in. long with two outlets, samples of flanging, miscellaneous brass valves, packing, etc. Messrs. J. A. Minwegan and F. C. Sabin represent the company.

Cutler-Hammer Manufacturing Company, Milwaukee, does not attempt to make an exhibit of its numerous motor starting devices, but has instead furnished its large booth, which is on the east side of the building nearly opposite the main entrance to the Coliseum, as a reception room. Here all of the company's customers and friends are invited to make their headquarters while visiting the show. A model of the new C-H porcelain switch and a typical sample of steel mill contractors are displayed. Mr. R. M. Van Vleet represents the company.

Del Sales Company, Chicago, is making a display of Del electric curling irons and other electric heating devices. The curling iron is of simple construction and it is said that by its use the hair will remain in curl several days. It is also asserted that the highly polished surface of the iron imparts a luster to the hair. The device can be quickly attached to an ordinary electric-light socket. Messrs. W. M. Williams and T. M. Craven represent the company.

Driver-Harris Wire Company, Harrison, N. J., exhibits its line of resistance alloys in the form of round and flat wire. It also displays Nichrome wire glowing at working temperature in the open air to demonstrate the non-oxidizable properties and efficiency of this wire for all types of heater work. Nichrome wire has a resistance 60 times that of copper. It is noncorrosive, ductile and can be worked unprotected at temperatures up to 1800 deg. Fahr. Climax (a nickel-steel alloy), Advance (a copper nickel alloy) and Monel metal are among the other alloys shown. Messrs. Arlington Bensel, E. G. Duble and L. O. Hart represent the company.

Duntley Manufacturing Company, Chicago, exhibits Duntley pneumatic cleaners in all sizes for operation, both by electricity and by hand power, together with a portable electric generator to operate the electric cleaners and other household devices intended to be operated by electricity. Mr. Halsey D. Payne represents the company.

Electric Clearance Company, Chicago, makes an exhibit of portable electric vacuum cleaners. In addition to its machine known as the Positive, the company is showing a new vacuum cleaner bearing the name Reliable, which is just being placed on the market. The Reliable has all of the good features of the Positive, but is made in a little different shape and is light enough to be carried about easily by one person. Messrs. J. M. Rodger and C. W. Grout represent the company.

Electric Heated Garment Company, Chicago, exhibits an electrically heated bath robe. This garment is said to contain 7000 ft. of resistance wire and is designed for a maximum temperature of 135 deg. Fahr. It may be used to supply comforting heat to well persons, but is more particularly adapted for the use of invalids and is said to be especially useful in cases of rheumatism. Mr. G. L. Jackman represents the company.

Electric Storage Battery Company, Philadelphia, exhibits all types of storage batteries, including samples of the plates used in the United States navy submarine boats. A miniature model of a submarine boat is shown and of further popular interest are duplicates of batteries used by Jack Binns on the steamship *Republic,* the Chloride accumulator being standard for use with Marconi wireless system. The exhibit also includes samples of the company's couple-types now used for electric plants for farms and factories. An electrically heated casting machine is in operation and produces souvenirs which are distributed to visitors. An interesting feature of the exhibit is a large map showing the company's 22 batteries used on the Commonwealth Edison circuits in Chicago and also the 11 Chloride batteries used on the surface and elevated railroads of Chicago. The extent to which storage batteries are used in Chicago is a revelation to the laymen visiting the show. The map is entitled "Chicago's Electrical Watch Dog." Messrs. Atkin, Milton, Marshall, Baird, Cressey, Rosholt, Beck and Neth represent the company.

Electrical Testing Laboratories, New York, have an instructive exhibit designed to show the color values of modern electric illuminants with the aid of specially constructed booths which conceal the lamps while displaying the characteristics of the light. The appearance of colored fabrics when illuminated by various types of lamps affords an interesting study of light quality. The relative brightness of screens illuminated by the lamps illustrates the great progress that has been made recently in the efficiency of electric illuminants. Messrs. Wilson S. Howell and Norman D. Macdonald represent the company.

Electrical World, New York, shows at its booth, which is in the same location as last year, samples of the *Electrical World* published by the McGraw Publishing Company. Messrs.

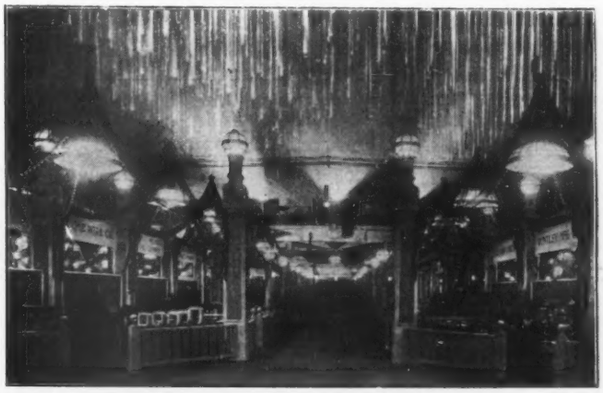


Fig. 2—A Vista on the Floor of the Exhibition.

H. T. Matthew, R. B. Withrow, J. R. Cravath, W. E. Keily and others represent the paper.

Electromagnetic Tool Company, Chicago, shows its new electric hammer in operation. This tool is particularly designed for the drilling of concrete, brick and stone. The amount of electric energy required is 3.5 amp at 110 volts. This device differs from previous electric percussion tools in that the blow is produced, not by direct action of an electromagnet on the plunger or by the centrifugal force of a flywheel arrangement on the motor shaft, but by means of a magnetic clutch so arranged as to provide adequate cushioning of the blow so as to prevent sudden strain on the motor. Messrs. Rowe, Knowlson, Elder and Ufer represent the company.

Empire Vacuum Company, New York, exhibits the Imperial vacuum cleaner. This machine is distinguished for its simplicity and comparatively light weight. A 1/5-hp motor is directly connected by a shaft drive with a rotary vacuum pump. The weight is about 50 lb. and the machine is easily portable. The cabinets are made of mahogany or oak with polished brass and aluminum trimmings. Messrs. C. Q. Adams and B. R. Nevius represent the company.

Enterprise Optical Manufacturing Company, Chicago, has a Motiograph motion-picture machine and also energy-saving devices for motion-picture work, using either alternating or direct current. The Motiograph has a special patented fireproof shutter and other features such as a wide-open lamp

house for convenience in trimming and maintaining the lamp, which are said to make it of especial excellence among moving-picture machines. Mr. A. C. Roebuck and others represent the company.

C. G. Everson & Company, Chicago, display a few styles of their tungsten shower effects for general effective lighting. In addition, the exhibit includes an extensive line of water purifiers and coolers for the requirements of houses, offices, factories and public institutions. Messrs. C. G. Everson and R. B. Everson represent the company.

Excello Arc Lamp Company, Chicago, exhibits its rocker-beam flaming arc lamp for alternating and direct current. On alternating current this lamp has the advantage that the arc is struck immediately, which is believed to be a radical improvement over the old rotor type in the matter of speed in starting. The exhibit also contains self-contained compensatory lamps for operation on 220 volts and over. Globes of different styles are shown to demonstrate the varying distribution of light which can be accomplished for different conditions of illumination by adjusting the style of glassware to the needs of the installation. Another type of lamp shown is the Excello axis type which with vertical carbons is nevertheless adapted for very low ceilings. Messrs. H. M. Hirshberger, G. W. Armstrong, H. Caird, T. W. Hall, W. J. Gille, J. H. Stanley, R. C. Carr and C. M. Browster represent the company.

E-Z Vacuum Cleaner Company, Chicago, displays vacuum cleaning machines. This company shows a comparatively low-priced machine specially adapted for household use. Messrs. Chas. W. Lasher, Jr., Forrest O. Poor and others represent the company.

Fairbanks, Morse & Company, Chicago, exhibit a large collection of electrical machinery. There are 14 alternating-current polyphase motors, ranging in size from 1 to 30 hp and of the squirrel-cage and slip-ring types. An engine-type alternating current generator of 100 kw is also shown. In addition there are nine direct-current motors ranging in size from 1 to 15 hp. An interesting feature of the exhibit that attracts much attention is a farm-lighting equipment. This consists of a 2-hp gasoline engine (driven in this case by a small alternating-current motor) which operates a direct-current generator wound for 30 volts. This generator supplies electricity to charge a storage battery and for 50 15-watt tungsten lamps. The little installation is complete with a switchboard, and the lamps shown in connection with this installation are the new Monarch Mazda lamps with Holophane shades. In addition to the farm-house lighting installation, Monarch lamps are shown in various sizes. Messrs. L. J. Osborn, M. O. Southworth, A. O. Reed and J. M. Johnson represent the company.

Federal Electric Company, Chicago, has an exhibit of electric signs that attracts attention. Various types are shown, including the standard porcelain enameled steel sectional and panel signs, as well as painted skeleton letters. The company also exhibits a number of standard fixtures and on a sample board displays a variety of small articles which it makes, such as sockets, bushings, outlet box covers, Dim-a-lites, porcelain enameled steel shades, etc. The Federal vacuum cleaner is conspicuous and there is also an interesting exhibit of new kitchen appliances operated by electricity. The sample board is illuminated with the new Adlite window reflector signs. A number of couch brackets, portables and small fixture brackets are shown in the back of the booth in a separate exhibit. Messrs. James M. Gilchrist, L. G. Shepard, F. H. Welling, G. G. Beck, C. B. Graves and F. E. Atkins represent the company.

Fort Wayne Electric Works, Fort Wayne, Ind., have an interesting assortment of motors, transformers and instruments. The motors are both direct current and alternating current and range in size from ¼ hp to 100 hp. The exhibit includes a 5-kw, type A transformer and a cross-section of this type transformer, as well as a series transformer and a shunt transformer. Other instructive features of the exhibit are a 60-cycle calibrator of the new style, various types of wattmeters, a direct current Compensarc of 220 volts and an alternating-current, 60-cycle Compensarc, as well as several of the new bell ringing transformers. Messrs. A. L. Pond, L. A. Carr, A. J. Francis, H. Plumley and A. E. Stevens represent the company.

Fort Wayne Engineering & Manufacturing Company, Fort Wayne, Ind., has an exhibit in the booth of the Fort Wayne Electric Works. This company shows its new double acting piston power pump. This pump, which is operated by a direct-connected, alternating-current, 1-hp, 110-volt, 60-cycle, repulsion motor, can be made entirely automatic if desired, and is considered as particularly well adapted to supply water in city or country homes, pumping from shallow wells or cisterns, or for raising the pressure in city water systems. The pump is particularly interesting among power pumps from the fact that it is neither a centrifugal nor a rotary pump. Mr. J. H. Haberly represents the company.

General Acoustic Company and **National Dictograph Company, both of New York,** make a combined exhibit. The former shows and demonstrates instruments intended to enable the partially deaf to hear, while the latter exhibits the apparatus for equipping office buildings with the dictograph system for intercommunication. Mr. J. F. Sherbino represents the Acoustic Company and Mr. Kleeman the Dictograph Company, while Mr. C. F. Faxton represents both companies.

General Electric Company, Schenectady, N. Y., pays particular attention to lighting and heating appliances in its large, centrally located exhibit near the main entrance. There is a very complete line of the new intensified arc lamps which are particularly designed for store interiors, where a strong light is needed, or where diffused or concentrated lighting effects are desired. The new Mazda incandescent lamp is shown in ornamental incandescent diffusers and Holophane shades. The line of electrically heated cooking devices is quite complete and includes coffee percolators, toasters, tea pots and many other utensils. Two lady demonstrators are in attendance and they serve coffee, toast and other electrically cooked viands. Electric flatirons form a feature of the exhibit and a quiet-footed Chinaman stolidly at work at the ironing table with the modern iron forms an attraction for passers-by. Other features are luminous radiators and a Rathbone-Panigot electric mantel. Two display panels show the latest sockets and other wiring devices made by the company. One of these panels was shown at the Boston exhibition and attracted much attention. A photometer with a recording wattmeter forms a part of the exhibit and by its use comparisons are made to show the amount of light obtained from different illuminants with the same current consumption. The new type of drawn-shell motors, with alternating and direct current, are shown in sizes ranging from 1/30 to 1/10 hp. These small motors are used for sewing machines and the like, and it is probable that this style of frame may be used for all the company's fan motors at some future time. The 1910 type fan motors are shown and there is also a display of miniature lamps. Messrs. F. H. Gale, W. H. Colman, J. H. Cross, F. T. Benson, C. M. Axford, Louis Friedman and others represent the company.

General Vehicle Company, Long Island City, N. Y., has an exhibit of electric commercial vehicles. The available space, although including two of the regular size booths, only permits the display of the 1000-hp delivery wagon and the 4000-lb. truck. One of these is jacked up so that the wheels are operated with the battery in the wagon. The delivery wagon has a battery capacity of 135 amp-hours and is rated for a speed of 12 miles an hour. The truck has a battery capacity of 216 amp-hours with a speed of 9 miles an hour. In the case of the delivery wagon the minimum current necessary for charging is 16 amp, while the corresponding current for the truck is 26 amp. In each case the controller gives four

forward and two reverse speeds. Messrs. P. C. Chrysler, R. W. Maginnis, E. Marvin and J. J. Cuff represent the company.

G. M. Gest, conduit engineer and contractor of New York, Cincinnati and Chicago, displays a full-size brick manhole with fiber conduits leading out on one side and clay conduits on another side. This manhole is equipped with the Gest patented bracket frame and hangers and contains several sections of spliced cable. Messrs. W. T. Jackson and J. A. Doyle represent Mr. Gest.

Hahl Automatic Clock Company, Chicago, exhibits an automatic pneumatic clock, a clock program system and a push-button switchboard in connection therewith. In the automatic clock system a master clock operates any number of secondary clocks by alternate impulse and release of air. In the automatic-clock program system the master clock may be equipped with program apparatus and thus control and operate both secondary clocks and signals. Signals may be given on any number of electric circuits and at one minute intervals. They may be automatically eliminated on days or hours when not desired. The push-button board permits the changing of signals from one circuit to another. Messrs. H. H. Gross, L. B. Montgomery, P. J. Hertz, H. R. and Carl Mendius represent the company.

David T. Hallberg, Chicago, exhibits the Vak-Klean portable vacuum cleaner. This machine is made by Hanlon & Wilson, of Wilkinsburg, Pa., but is exhibited by Mr. Halberg.

Hamler-Eddy Smoke Recorder Company, Chicago, exhibits the Eddy automatic smoke recorder. This is an instrument carrying a card calibrated for time on which is blown and affixed a continuous ribbon of smoke of the precise shade and density appearing at the top of the power plant stack. The instrument on exhibition is connected with the Coliseum chimney and is shown in operation during the show. Mr. R. L. Eddy, the inventor of this instrument, is in charge of the exhibit.

Hinde & Dauch Paper Company, Sandusky, Ohio, exhibits corrugated fiber-board packages especially designed for shipment of fragile articles. Special attention is called to packages designed for shipment, by freight or express, of incandescent lamps. Messrs. D. A. Larkin and E. J. Eiserman represent the company.

Hoover Suction Sweeper Company, New Berlin, Ohio, shows its new model No. 3 cleaning device. In this machine the action of the fan and rotary brush produces a cleaning result said to be particularly efficacious. Vibration, sweeping and suction are all combined in the machine's operation. Messrs. R. E. Griswold and C. D. Blatner represent the company.

Hoskins Manufacturing Company, Detroit, Mich., shows industrial and domestic applications of electric heat. The Hoskins patented nickel-chromium resistance element is shown in actual operation and its development and use are exemplified. The industrial application of this metal is shown in various types and sizes of electric furnaces. Applications of the element are also shown in the Hoskins laboratory hotplates and the Hoskins soldering irons—new products which are capable of producing very high temperatures. The cheery little Toastove which has been termed "the most attractive appliance using electric energy," is a distinctive feature of the exhibit. Messrs. H. Halph Badger, W. V. Young, C. F. Bussee, A. S. Lee and D. A. Kimbark represent the company.

Houston Manufacturing Company, Rockford, Ill., exhibits a stationary vacuum-cleaning plant suitable for use in residences, churches, hotels and offices. The machine is of one sweeper capacity and the entire plant is controlled by a single switch. The bearings are oiled automatically and the machine is compact and said to be of high efficiency. Messrs. F. K. Houston, W. S. Sutton and H. A. Kirby represent the company.

Hurley Machine Company, Chicago, has a large and instructive exhibit of Thor electric laundry machines for the home. Electric washers and wringers are shown and also the "universal rod," which, in connection with the Thor electric washer, may be used to drive an ice cream freezer, meat chopper, ironing machine or any one of a number of other small machines used about the house. One-half of the exhibit is devoted to the Thor "model home laundry," which is of much interest. Messrs. Neil C. Hurley, Edward J. Riedy, V. D. Smith, W. A. Murfey and N. H. Haberle represent the company.

Illinois Appliance Company, Chicago, displays and demonstrates its adaptable lamp changer. This is a device intended for the users of incandescent electric lamps by which lamps placed in remote or inaccessible places may be installed, removed for cleaning or replaced. The machine will work at any angle and can be used with any length of extension pole. It is adapted for incandescent lamps of all sizes and shapes. Messrs. F. G. White, G. F. Long and W. P. Whitaker represent the company.

Jewel Electric Company, Chicago, exhibits its storage batteries and an interesting method of cutting metals or opening safes by the intense heat supplied from an arc by means of carbon points made for the purpose. Mr. J. E. Haschke, who has devoted much attention to the cutting of metals by the electric arc, represents the company.

Judd Laundry Machine Company, Chicago, displays electric family laundry machines. The tub is of an unusual shape and is made of copper. It oscillates through a vertical plane, completely reversing itself more than 100 times a minute. Springs which are attached to the tub aid the motor in giving the quick reversal which throws the suds and air through the garments that are being washed. A wringer, operated by the motor, is attached to the machine. Messrs. Ira M. Smith, Henry S. Judd and Charles U. Beach represent the company.

Keller Manufacturing Company, Philadelphia, displays its Santo portable vacuum cleaners. This is a round machine with top and base of cast aluminum and is operated by an ⅛-hp electric motor. Demonstrators show it in actual operation. A conspicuous feature of the exhibit is a large vacuum cleaning machine of the stationary type such as is used in hotels and public institutions. This also is shown in operation. Messrs. Julius Keller, Charles Strader, George F. Duff and A. J. Saunders represent the company.

Charles L. Kiewert Company, Milwaukee, shows the Alba, Aurola, Economy and Trucolor arc lamps. The last named lamp is arranged in such a manner that comparisons can be made with other lighting sources for show window lighting. The Economy is a half enclosed arc lamp for illuminating comparatively small spaces. The Alba and Aurola flaming arcs are shown with recent improvements, such as the round globe and enlarged lower globe ring for the former and the "rapid striker," both for 60 and 25 cycles, for the latter. In addition to its inside exhibit, the company furnishes 12 Alba flaming arc lamps for the front illumination of the Coliseum, giving a fine effect with the clear white light of these flaming arcs. Messrs. R. W. Kiewert, K. A. Albrecht and H. W. Fowzer represent the company.

Kimble Electric Company, Chicago, has on exhibition its high-efficiency polyphase motors. These three-phase motors range in size from ¼ to 7½ hp and are said to be characterized in addition to high efficiency by high power factor, large starting torque and small starting current. In addition the exhibit includes a full line of the Kimble variable speed, single-phase motors. One of these is connected to a church organ pumping attachment, another to a job printing press and others to 18-in. and 24-in. ventilating fans. All this machinery is shown in operation, as are also some small blowers operated by ⅛ and ¼-hp motors. Messrs. A. Kimble, James K. Bass, Perkins B. Bass and others represent the company.

Kirkpatrick Conduit Company, Chicago, displays its vitrified clay conduit in single duct and various multiple duct sizes. The exhibit also includes hydrolithic cement for waterproofing cables, as well as cable vaults, manholes, etc. Mr. E. F. Kirkpatrick represents the company.

Mathias Klein & Sons, Chicago, display linemen's and electrical construction tools at the same booth they had last year. The line of tools shown is diversified and complete and is adapted for pole line work as well as for underground construction and interior wiring. The new Goehst insulation stripper is shown, as well as grips for small wires and cables, gasoline torches, wire reels, pliers, wrenches and a large assortment of other tools. Messrs. John M. Klein, Jr., Alex. J. Klein and Paul Herbst represent the company.

A. W. Kratz, Chicago, exhibits his "1900" electric washers. Low priced washing machines for families as well as larger hotel size outfits are shown. In the low priced washer the motor will operate the washing machine only, but in the larger or hotel size the motor will run both washer and wringer. There is also a family size in which the motor will operate both washer and wringer. Mr. Kratz's sons, Fred and Edward Kratz, represent him at the show.

Long Beach Electric Manufacturing Company, Long Beach, Cal., makes an exhibit of the Tidmarsh recharging enclosed fuse. All sizes of this compact device are shown. These fuses can be recharged for less than 75 per cent of the cost of a new fuse, it is said. Mr. W. H. Tidmarsh represents the company.

Macbeth-Evans Glass Company, Pittsburgh, Pa., has quite an elaborate exhibit which contains some novelties. The display of electrical glassware has been arranged principally to show the decorative effects chosen from several varieties of products. One of the principal features is the showing of Alba reflectors, giving a demonstration of the utility of these reflectors both for decorative use and for efficient lighting. For the first time there is also shown Alba glass in structural forms, these being illuminated in such a manner as to obtain effects like those attained by the use of sculptural marble. Messrs. Lorin W. Young and R. C. Kay represent the company.

Manhattan Electrical Supply Company, Chicago, exhibits a new line of high-grade wireless telegraph material of its own manufacture intended for experimental or students' use. The number of amateurs interested in wireless is really astonishing, and this display is proving, therefore, of much interest to a large proportion of the visitors at the exhibition. Messrs. N. S. Richmond and A. C. Holland represent the company.

Milwaukee Vacuum Machinery Company, Milwaukee, Wis., has on exhibition both its stationary vacuum cleaning system and portable vacuum cleaners, the latter both of the light and heavy type. The company exhibits for the first time a heavy portable cleaner suitable for railroad and large commercial work. Mr. S. M. Sutherland represents the company.

National Acme Manufacturing Company, Cleveland, has an Acme automatic, multiple-spindle screw machine in operation that attracts much attention. The machine is driven by a 1-hp motor and produces nurled nuts about ½-in. in diameter for use in telephone work. Messrs. E. C. Woolgar, E. G. Matter, R. J. Preston, A. G. Johnson and H. T. Latto represent the company.

National Carbon Company, Cleveland, Ohio, displays a complete line of carbon products. This exhibit is of an educational nature, and demonstrations are made of the use of some of the products. Carbons for primary batteries, motor brushes, arc lamps and electrodes are shown, as well as carbon packing rings for turbines and many other carbon specialties. The company is collecting exhaustive data on service conditions in various lines in which carbon products are used. The object of this research is to make it possible to produce a product so graded and classified that specific recommendations can be made to operating companies as to maximum results at minimum cost. The company is developing a department to co-operate with customers to obtain efficiency and satisfaction in the use of its products, and it solicits inquiries from all users of carbons, whether made by itself or others. Messrs. H. A. Worman and A. G. Summerell represent the company.

National Electric Lamp Association (Engineering Department), Cleveland, has, as usual, a large and particularly instructive exhibit. The showing consists of a complete line of 110 and 220-volt tungsten lamps of the Mazda brand. Tantalum lamps for the same voltages are also shown, as well as Mazda series lamps for street lighting, sign lamps, miniature lamps and tantalum lamps for street railway service. Five new features may be specifically mentioned: (1) Device consisting of box in which are mounted three mirrors and lamp. By revolving the box about a horizontal axis the observer learns what is meant by "light distribution about a lamp." (2) Crude photometer showing balance of screen for tungsten and carbon lamps of equal wattage. Belt sign in photometer box moves slowly enough to be read. (3) Set of automobile lights equipped with latest types of Mazda lamps. (4) Illustrations of old and new methods of individual machine lighting, embracing carbon lamp with wire guard and tantalum lamp with D'Olier reflector. (5) Ten 16-cp carbon lamps and 10 16-cp tantalum street railway lamps are burned continuously during the show. An integrating wattmeter connected to each type of lamp will give a comparison of the consumption of electricity. Messrs. J. B. Crouse, H. M. Vanzwoll, S. E. Doane, W. M. Skiff, P. S. Dodd, P. F. Bauder, H. S. Hall, J. D. Hoit, A. J. Hitzker and C. O. Brandel represent the company.

Neville Illuminating Sign Company, Chicago, has a handsomely decorated booth, the principal feature of which is five electric signs operated by the Neville patented system of sign lighting. This system consists of signs so constructed that one group of lights illuminates both sides of the sign. Messrs. C. S. Neville, R. M. Grattan, R. M. Martin, A. F. German and Fred Gilbert represent the company.

Henry Newgard & Company, Chicago, show as the principal feature of their exhibit a four-panel switchboard of blue Vermont marble equipped with high-grade instruments, circuit breakers and switches. Other features of the exhibit are Newgard waterproof receptacles, cut-out cabinets and panel boards. Messrs. Henry Newgard, Martin Newgard, C. M. Johnson, F. G. Smith and W. C. Kenney represent the firm.

New York Pole Company, New York, of which Mr. G. M. Gest is general manager, shows a number of sections of reinforced electric railway poles. This is the first time this method of treating poles has been exhibited in Chicago. Messrs. W. T. Jackson and J. A. Doyle represent the company.

Nohe Electric Renovator Company, Chicago, shows the Nohe electric vacuum cleaner. This compact machine is but 14¼ in. square and weighs 25 lb. It is said to do all kinds of vacuum cleaning as well as any other machine on the market. The casing contains a centrifugal fan, a ⅛-hp electric motor to drive it and a dirt chamber. A hose, brush and nozzle complete the machine. Messrs. A. W. Nohe, I. A. Nohe, W. S. Nohe, Henry Waltersdorff, W. D. Evans and Peter Kone represent the company.

North Shore Electric Company, Chicago, the central station company operating in the suburban areas around Chicago, has an exhibit of small industrial installations of motors not exceeding ½ hp in rating. The company distributes circulars giving publicity of a general nature to the territory served by the company and also referring to some of the company's special propositions. In the territory served by the company are a number of desirable manufacturing sites and this fact, together with the added statement that the company is supplying electrical energy for power in large quantities, is brought out prominently in the booklet. Messrs. George H. Lukes, John G. Learned and others represent the company.

Oral & Motion Manufacturing Company, Chicago, displays an electrically lighted and operated advertising device which presents consecutively moving posters or display cards of different colors and subject matter and which also, by an ingenious phonographic arrangement, talks in a human voice

about the things advertised. Mr. L. S. Treat and others represent the company.

Pacific Electric Heating Company, Chicago, exhibits electric flatirons and says that they are the only ones that have the full indorsement of the underwriters. These irons are of the automatic type and are manufactured in six sizes. All irons of this type supplied in the future will bear the stamp of the National Board of Fire Underwriters, it is said. Last year the company exhibited the largest electric iron ever manufactured. This year it shows the smallest electric iron that has been put out, and that is the Utility iron, which weighs 2½ lb. With this iron is furnished a stand for reversing the irons, so that it can be used for cooking purposes. This stand is patented and application has been made for a patent covering an opening in the electric flatiron for heating curling tongs. Other electric heating and cooking devices are also shown. Messrs. H. F. Holland, J. P. Richardson, H. Fish, Miss Nan Martin and Miss Lucile Blank represent the company.

Pelouze Electric Heater Company, Chicago, shows not only the Pelouze Universal electric flatirons, but several new household heating devices. During the year this company has added to its line a 9-lb. commercial flatiron and also a 20-lb. tailor's goose, the latter operated by a new three-heat switch. Other new devices shown in the exhibit are a disk heater made in three sizes, a tea kettle, frying pan, a novel coffee extractor, a tea samovar, a water heater or liquid cooker and a new combination stove toaster and griddle. All of these articles, with the exception of the stove toaster, depend upon a round heating unit which is complete in itself and separate from the vessel, similar to the units used in flatirons. The water heater is constructed somewhat on the principle of the fireless cooker, having double walls which are thoroughly insulated, and is said to be of particularly high efficiency for heating liquids. The stove toaster and griddle takes 400 watts and will make toast, it is said, in 45 seconds and griddle cakes in 30 seconds. Messrs. Wm. N. Pelouze, Chas. P. Madsen and A. A. Guardia represent the company.

Perfection Vacuum Cleaner Company, Chicago, has an exhibition three vacuum cleaning machines, two of the stationary type and one portable. One of the stationary equipments is intended for household use and is equipped with a 1-hp alternating-current motor. The other stationary machine is a larger one, intended for hotels and public buildings, and is operated by a 2-hp direct-current motor. The portable machine has a ½-hp alternating-current motor, and all are equipped with noiseless belt drive. Demonstrators show the machines in actual operation. Messrs. J. L. Wallace, Harvey Wallace and O. E. Becker represent the company.

M. L. Schlueter, Chicago, shows and demonstrates two of his electric floor-surfacing machines. One of these ingenious mechanisms is specially adapted to the surfacing of cement, stone or composition floors, while the other is a floor surfacer adapted for wooden floors with a roller on which is clamped the surfacing or polishing material which may be sandpaper or cloth. This latter machine weighs about 175 lb. and has a 2-hp direct-current motor. The stone-floor surfacer is equipped with rubbing blocks and has a 1½-hp direct-current motor. The motor propels the machine in each case, as well as operates the surfacing mechanism.

Schneible Company, Buffalo, N. Y., exhibits a two-stage electrically driven centrifugal pump and two speed reducing devices, both the pump and the speed reducing devices being in operation. There are also the various parts necessary to show the details of construction and the method of operating this machinery. Messrs. Schneible, Zahm, La Bour and Braun represent the company.

Sefton Manufacturing Company, Chicago, displays waterproofed corrugated fiber-board boxes, as well as other varieties of fiber and folding paper boxes. The company is featuring corrugated fiber board and three-ply fiber freight boxes. These articles are comparatively new in the electrical trades for freight shipment, but they are much lighter than wooden boxes and save room in storage because they fold flat. The company urges that all small appliances should be enclosed in individual folding boxes, so that the article may be delivered in a neat package and in good condition. Messrs. J. P. Brunt and R. E. Ferguson represent the company.

Walden W. Shaw Company, Chicago, is one of the automobile exhibitors. The feature of this exhibit is a handsome Columbus four-passenger, inside-operated electric coupé. Mr. Harry Cairns and Mr. Farrington represent the company.

Shelton Electric Company, New York and Chicago, shows vibrators, electric hair dryers and electro-therapeutic appliances. A particularly interesting feature of the exhibit is what is said to be the smallest and lightest vibrator in the world. It is similar to the well-known Shelton vibrator, but weighs only 24 oz. The name De Luxe is given to this electric vibrator, which is apparently an efficient, high-grade machine, nothwithstanding its diminutive size. Another interesting novelty is the new Dragon Vibro vibrator which introduces a new principle into the art of massage; that is, vibratory hand massage. In applying massage with the hand, the additional efficacy of "high frequency" vibration may be employed at the same time by means of the Vibro attachment fastened to the back of the hand. The attachment may also be adjusted to transmit the vibration through the whole body at once if desired. There is also a complete display of electric hair dryers for both private and professional use. President Shelton and Mr. J. M. Peacock represent the company.

Thomas H. Sidley Company, Chicago, which makes a specialty of store illumination, exhibits its single unit corrugated-mirror window reflectors. Mazda 150-watt lamps are used in these reflectors. Messrs. Thomas H. Sidley and T. Gaggs represent the company.

Simplex Electric Heating Company, Cambridge, Mass., has, as in former years, an exceptionally interesting demonstration of the use of electric heating appliances. All sorts of heating devices are shown in the company's space in the northern section of the building, but the special features are three different sizes of electric ranges, each complete and arranged to turn out any product of the culinary art. By an arrangement with the Davies Laundry Company an interesting exhibition of practical ironing by means of the electric flatiron is given by four operators. Among the new devices displayed this year is the Simplex electric toaster for domestic and hotel use, as well as several new models of flatirons, chafing dishes, percolators, etc. Messrs. H. R. Hixson, J. N. Macalister, J. G. Brobeck, W. F. Hruby, Geo. W. Plachek and E. R. Jacobs represent the company.

Stolz Electrophone Company, Chicago, exhibits electrical hearing devices for the partially deaf, making ingenious applications of the microphone principle. Attention is directed to the difficult combination of an extremely sensitive transmitter and a clear enunciation, the latter having been heretofore lacking in devices of this character, it is said. The exhibit also includes improved apparatus for use in churches and auditoriums. Dr. Coy, Dr. Edmonson and Mr. J. S. Linde represent the company.

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., shows a complete line of telephone apparatus, including the new key type, intercommunicating telephones designed for both flush and standard construction. There are also exhibited telephones for use in mines and on railroads, as well as the company's selective dispatcher signal for use on interurban roads. Several different types of switchboards are also displayed, including both magneto and central energy systems with standard equipment. Mr. A. M. Haubrich is in charge of the exhibit, assisted by Messrs. Paul D. Myers, E. P. Shafer, H. C. Slemin, Cannon, Lewis and Stigberg.

Stromberg Electric Manufacturing Company, Chicago, displays the Stromberg electric chronograph, which is an electrically operated time recorder, particularly adapted for registering the in and out time of employees in factories and busi-

ness houses. It is also used for time cost keeping in factories, using job or daily time cards, and it is also applicable to general office purposes. The system employs one master clock which controls the electric circuits for any number of chronographs. Messrs. A. Stromberg, H. A. Jones, B. Pedersen, A. L. Denniston, W. R. Blake and F. G. Kauffman represent the company.

Studebaker Bros. Manufacturing Company, Chicago, exhibits two electric automobiles, one a four-passenger coupé and the other a four-passenger single folding landaulet. The latter is a new type and is provided with an extension front which protects the occupant of the car from the wind exactly as does the wind shield on a touring car. This front may be folded down when desired and so the car is quickly convertible from a closed to an open type, or vice versa. The Studebaker exhibit is conspicuously placed near the main entrance of the Coliseum. Mr. W. G. Palmer represents the company.

Swedish-American Telephone Company, Chicago, has a complete line of telephone apparatus, including switchboards, telephones and parts. Complete exchange equipments are shown and particular attention is directed to the Radio telephone holder. Messrs. E. B. Overshiner, A. V. Overshiner, W. O. Rhode and W. E. McCormick represent the company.

Swedish Electric Vibrator Company, Chicago, shows and demonstrates its vibrator. Mr. Aldrich and assistants represent the company.

Telechronometer Company, Rochester, N. Y., exhibits (in the booth of the Stromberg Electric Manufacturing Company) a time measurement meter system for telephone exchanges. The telechronometer does for the telephone what the watthour-meter does for electric service companies; that is, it supersedes flat-rate telephone charges by the use of an accurate time-use measurement. Messrs. Garrison Babcock and W. M. Mead represent the company.

Tel-Electric Company, Chicago, displays the Tel-Electric piano-player attached to both upright and grand pianos. The device is demonstrated by one of the company's experts in a sound-proof compartment with plate-glass windows. The booth is attractively decorated and is in charge of Mr. G. A. Pond.

Ralph Temple Automobile Company, Chicago, displays Baker shaft drive electric automobiles and Jackson gasoline motor cars. The Temple Company represents the Baker Motor Vehicle Company, of Cleveland, in Chicago and the electrics shown are of particular interest because they are said to be the only electric automobiles in the world driven by a shaft drive, all others using chains. A chassis is exhibited showing the complete construction of the shaft drive for electric coupés, victorias and runabouts. Messrs. Ralph Temple, W. E. Croswell and V. G. Halla represent the company.

Thompson Bros. Company, Grinnell, Ia., exhibit electrically driven washing machines of the type known as "Elmo." This machine is motor-driven on the "back gear" principle, and in this way requires but little power for its operation. The motor is specially built for washing machine work and it also drives a wringer fastened to the frame of the washing machine. All the gears are enclosed. Mr. and Mrs. Mel. Ayer and Mr. W. C. McLean represent the company.

United States Light & Heating Company, New York and Chicago, displays all types of storage battery plates for light and power, propulsion, ignition and automobile lighting, in addition to a plate recently developed for car lighting purposes, which is made by the National swedging process. This last named plate is considered a noteworthy development in storage battery manufacture. The Bliss and Moskowitz car lighting system owned by the company is shown in detail. The entire exhibit is not only instructive from a technical point of view, but is proving of much interest to the general public. Messrs. Bertram Smith and W. M. Lalor represent the company.

Vulcan Electric Heating Company, Chicago, has an exhibit of electrically heated specialties which is of particular interest because the devices are shown working under service conditions. The Electrocurl is demonstrated by an expert hair dresser and any lady so desiring may have her hair dressed in becoming style free of charge. Vulcan high temperature soldering tools are shown on work of different kinds, both in this exhibit and in the power exhibit of the Commonwealth Edison Company. The Vulcan electric marking pencil is employed in the marking of shipping cases, boxes, etc. This is a comparatively new application of electricity for heating and practical demonstrations are made on hard and soft woods. Electric branders for wood, meat, leather, rubber and other materials are also shown in service and souvenirs are made on the spot by their use. These souvenirs are of heavy paper, which is one of the most difficult kinds of material to brand satisfactorily. Mr. H. H. Russell is in charge of the exhibit and Messrs. F. J. Holmes, G. W. Cravens and others also represent the company.

Western Electric Company, New York, devotes much of its space to telephones, but also shows Hawthorn fan motors, flaming arc lamps and miscellaneous electrical house goods. There is a complete working exhibit of Western Electric Interphones showing wall, flush and desk-stand types. The company is making a special effort to educate the public to the simplicity and usefulness of this system. To this end, several sets have been connected up and are demonstrated in the exhibit at the show. Attention is called to the simplicity, ease of operation and readiness for service which characterize the system. In the case of the flaming arc lamp, the attention of visitors is directed to the absence of complicated mechanism, the parallel carbon design and the gravity feed arrangement. Messrs. F. A. Ketcham, W. H. Tompkins, W. J. Doherty, Geo. H. Porter. Geo. Lounsberry, H. L. Grant and J. H. Gleason represent the company.

Westinghouse Electric & Manufacturing Company, Pittsburgh, displays a very complete line of its smaller apparatus, particularly that intended for domestic service. Coffee percolators, chafing dishes and other electric cooking devices are shown for the first time and are in service preparing coffee, welsh rarebit and other dainties for visitors. The instantaneous water heater is also demonstrated. In this device the heating element may be placed directly in the liquid to be warmed. The utility of the device is also demonstrated by the use of an attachment which may be fitted to it for poaching eggs in a most expeditious manner. Electric flatirons, tailors' irons, glue pots and chocolate warmers are also shown, as well as luminous and non-luminous radiators. In the small motor line is displayed a line of buffing motors for jewelers and dentists, with all necessary attachments. There are also a number of power motors for both direct and alternating current and several different types of fan motors. Motors for industrial service for both constant and intermittent service are shown with controllers and rheostats and one of the company's smallest Type A unit switch controllers, complete with master switch, is shown in operation. The exhibit also includes a Mercury rectifier charging outfit connected to an automobile charging panel and operating under load conditions. The Westinghouse Lamp Company exhibits a representative line of its 110 and 220-volt tungsten lamps and also low voltage tungsten lamps, the latter being connected with low voltage economy coils and sign transformers. Messrs. T. P. Gaylord, W. R. Pinckard, A. L. Millard, R. Everson, M. McNeil, E. M. Bischoff, S. Gardener, R. H. Morre, Charles Talbot, J W. Busch, C. W. Regester and W. Barnes, Jr., represent the company.

Wizard Washer Company, Chicago (formerly the **Judd Oscillating Cleaner Company),** exhibits the Wizard electric washing and wringing machine. In this machine the suds is thrown through the garments by an oscillating motion at the rate of 110 times a minute. A ⅛-hp motor operates the machine and also a reversible wringer attached to it which may be started, stopped or reversed practically instantaneously. Messrs. R. J. Killick, D. J. Kennedy, C. E. Roberts and O. W. Roberts represent the company.

Industrial and Commercial News

Commercial Intelligence.

THE WEEK IN TRADE.

The heavy snow storm of last week was the most prominent influence on the business of the country. Retail trade in winter goods was very largely increased, especially throughout the Far West, and reorders were rushed in to the wholesalers and jobbers in great quantities. The volume of orders for spring goods was also fairly good, and in these lines business was vastly improved. On the other hand, the railroads in many sections of the country were blocked, and the movement of merchandise was interfered with. At many points in the West there is a threatened shortage of coal, and on this account some small manufacturing firms are running on short hours. All building operations and outside employments are seriously retarded; indoor industries continue to be actively employed, and this is notably true in the iron and steel trade and of the boot and shoe industry. Western railroads have been in the market for equipment and for some rails, but as yet the Eastern lines have not placed large orders. A seriously disturbing feature of the week was the tremendous break in the cotton market. This has not only unsettled the trade in raw cotton, but it has temporarily almost paralyzed the textile industry. Manufacturers, as a rule, are fairly well equipped with high-priced material, but in spite of the break in the raw material, there have as yet been no cuts made in finished products. There is no indication as yet of any decrease in the high level of commodity prices, and manufacturers generally are uneasy over the prospect of the spring demands for higher wages. Collections are rather irregular, and can hardly be classed as satisfactory. This is due to some extent to the interruption, on account of storms, with the movement of produce to market. Business failures for the week ended Jan. 13, as reported by *Bradstreet's*, were: 291 as against 271 the previous week; 319 in the same week of 1909; 431 in 1908; 234 in 1907, and 279 in 1906.

THE COPPER MARKET.

The copper market during the past week was lifeless. Very little interest was shown by domestic consumers, and neither speculators nor exporters were in evidence to any considerable extent. The takings for domestic purposes were confined to a few moderate orders from brass foundries; the wire drawers being fairly well covered for January, February and March deliveries. The price of copper in the local market has been arbitrarily maintained by the producers, but it is said that in Europe there have been some concessions made for February and March deliveries. Abroad, too, the speculators have shown some disposition to sell, and it is now thought that the burden of carrying copper is becoming onerous. Statistically it is believed that the situation is improved. The production for January will certainly be reduced. While it is not admitted that the Amalgamated and other heavy producers are premeditatedly reducing their output, it is observed that "on account of snow, strikes, repairs of machinery" and other outside causes they are finding occasion to limit their production. Exports are on the average. So far for the month, including Jan. 17, they have been 13,541. The daily call on the Metal Exchange Jan. 17 quoted standard copper as follows:

	Bid.	Asked.	Settling price.
Spot	13.12½	13.50	....
January	13.12½	13.50	13.35
February	13.12½	13.50	13.35
March	13.12½	13.50	13.35
April	13.12½	13.50	13.35

The London prices Jan. 17 were as follows:

	Noon. £	s	d	Close. £	s	d
Standard copper, spot	60	12	6	60	12	6
Standard copper, futures	61	11	3	61	11	3
Market	Weak			Steady		
Sales of spot	500 tons					
Sales of futures	400 tons					

Extreme fluctuations for this year:

	Highest. £	s	d	Lowest. £	s	d
Standard	13.50			13.37½		
London, spot	£62	0	0	£61	1	3
London, futures	62	18	9	61	1	3
London, best selected	65	10	0	65	5	0

Great Northern's Use of Telephones.—The equipment of the Spokane Division of the Great Northern Railway with telephone train dispatching apparatus will complete a total of 2100 miles of line which this road is now operating in this manner. The Spokane Division extends from Troy, Mont., to Leavenworth, Wash., 337 miles. On account of the length of this division and the amount of traffic passing over it, two dispatchers are required. They will have on their dispatching circuits 45 way stations equipped with standard Western Electric telephones and Gill selectors. The standardization of this apparatus for the railroads of the country has included a testing device, which is installed throughout the Great Northern system. This is a panel somewhat similar to the well-known telegraph peg board, but containing telephone jacks and plugs. The circuits looping through an office, both telephone and telegraph, are wired through these jacks and by the operation of two keys and using the plugs at the dispatcher's orders, it is possible to patch up temporarily a line in case of trouble, to interchange circuits, to locate a break or a cross to the nearest station, in fact, to make all the simple tests ordinarily required on a circuit of this character. Another interesting feature of the Great Northern installation is the use of siding telephones on the Spokane Division. Seventy of these are to be installed. As the use of the telephone for dispatching has increased, the railroads, as in this case, have come to appreciate more and more the advantages of being able to allow the train crews to talk directly to the dispatcher at all important sidings. A siding telephone is sure to be at hand in case of emergency, as a large number of them have been installed. The fact that these siding telephones enable the dispatcher to reach train crews waiting at the sidings and give them orders to proceed permits him to take advantage of all changes in the schedule. When this equipment is cut into service the Great Northern will have a telephone train dispatching system the entire distance from Minneapolis to Seattle, with the exception of two short sections.

Toledo Electric Welding Company.—The Toledo, Ohio, Electric Welding Company has increased its capital stock from $30,000 to $75,000 and will move to Cincinnati, where it has closed a long lease on a two-story brick factory building, 160 ft. x 60 ft. An equipment of machine tools is being installed and the plant will be in full operation about Feb. 1, manufacturing electric welding machines for any kind of work. The officers of the company are: Neil MacNeale, president and treasurer; Walter G. Franz, vice-president; Frank Warren, secretary and general manager. These gentlemen with G. W. Drach and J. A. Muir are the directors of the company. Messrs. MacNeale, Franz and Drach are well-known Cincinnati business men. Mr. Warren has been connected with the company since its inception. The Toledo employees will move to Cincinnati.

Business Faith.—With the title "The Wages of Faith," the Stone & Webster Engineering Corporation, Boston, has issued an interesting pamphlet, giving a summary of replies received from 36 representative railroad men to an inquiry as to their opinion of the relative advantages of the fixed fee and unit price basis of doing construction work. It is pointed out that, regardless of favor for one or the other method, the replies are almost unanimous in including a qualification of good faith on the part of the contractor or, as epitomized at the end of the pamphlet, "It all depends on your contractor."

Allis-Chalmers Company Busy.—It is stated that the shops of the Allis-Chalmers Company are employing at the present time more workmen than ever before in the history of the concern. This does not mean, however, that the company is working up to its full capacity, for since the times of depression began the efficiency of the plants has been increased fully 20 per cent. The majority of the business is for small orders.

Electric Bus Service.—Mayor Gaynor of New York City has ordered the resumption of the public automobile electric bus service on Riverside Drive. The Park Commissioner, however, to whom the order was directed, has some doubt as to his authority in the matter, and before making the order has asked for an opinion from the corporation counsel.

Crocker-Wheeler Company Orders.—Recent sales of the Crocker-Wheeler Company aggregate more than 5,000 hp in direct-current motors and approximately 2,000 kw in direct-current generators and 2,000 kva in alternating current generators. Prominent among these sales is one to the Bethlehem Steel Company, of South Bethlehem, Pa., calling for five compound-wound interpole motors with a total output of 3600 hp. Two of these machines have a rating of 1000 hp each at a speed of 285 r.p.m. This company has also ordered 19 of the well-known C-W mill motors with a combined rating of nearly 800 hp. These orders will be an addition to the present equipment at the Bethlehem Steel Company's works of 10,900 hp in C-W motors. Another order calls for one 1200 kva alternating current generator to be used for light and power in the plant of the Miami Copper Company, Globe, Ariz. This generator is to operate at 107 r.p.m. and furnish 25-cycle, 3-phase current at 6600 volts. Other important sales are: Two 2300-volt, 60-cycle, 3-phase alternators with a combined capacity of 280 kva, to be shipped to the Western Electric Light Company, Weston, Mass.; one 600 kva, 600-volt, 171 r.p.m., 3-phase alternator for the Landes, Frary & Clark Company, New Britain, Conn. A 1500 kva generator is at present being constructed for this company. A large amount of smaller equipment has also been ordered recently, much of which is for textile mills.

Good Demand for Platinum.—The demand for platinum during 1909 was steady and was reasonably large. In fact, before the end of the year the demand had about reached normal proportions. Speaking of the condition of the platinum industry, Cyrus Osborne Baker, one of the largest platinum importers in the country, said: "We had a very satisfactory year in the platinum trade in 1909, and the demand at the present time is average. The business done last year was especially gratifying from the fact that there were only slight variations in price. What we want is a steady price rather than either cheap or high platinum. The low mark last year was never below $26 an ounce, and the high mark never above $30.50. Just at the present time the market is a little easier than its top price, owing to the lull that always occurs after the holidays. We have heard nothing more about the Russian Government putting an export tax on platinum, or authorizing the Imperial Bank to lend its support to the platinum producers. This was probably a rumor started to force buyers to take hold during the dull period. As a matter of fact, any action taken by the Russian Government which would fix a minimum below which platinum would not be allowed to go, would be an advantage to the manufacturing trade in this country and Europe."

Toronto Electric Light Company Changes.—A number of important changes in the management of the Toronto Electric Light Company have been announced by the directors. J. J. Wright, for 27 years general manager of the company, becomes second vice-president and consulting engineer; Hubert H. Macrae resigns from the general managership of the Electrical Development Company and is appointed to Mr. Wright's former position as general manager of the Electric Light Company; W. A. Martin, for some years secretary, is made assistant manager; R. F. Pack is promoted from accountant to be secretary and comptroller, and Mill Pellatt, heretofore cashier, is appointed treasurer. The changes have caused rumors to be circulated that a movement was on foot to hand the control of the company over to the Electrical Development Company, which is controlled by William Mackenzie through the Toronto Railway Company. Mr. Wright said that he had heard nothing to lead him to such a conclusion. The business of the company, he said, has increased so largely that it was necessary to divide the work.

Electric Locomotives for New Haven Railroad.—Two new freight electric locomotives, built for the New York, New Haven & Hartford Railroad by the Westinghouse Electric & Manufacturing Company, are being tested at the East Pittsburgh shops. It is expected that they will be put into service between Stamford, Conn., and Mt. Vernon, N. Y., early in February. These locomotives are entirely different in construction from the electric locomotives now in service on the road. The center of gravity has been raised to save the wear on the tracks, and one of them has been equipped with side driving rods, like the Pennsylvania Railroad locomotives.

Keokuk Water Power Development.—It is announced that the hydroelectric project which for some time has been planned for Keokuk, Iowa, has been successfully financed, and that construction work upon the dam will soon be commenced. The dam, which will be constructed under supervision of the War Department, will be 5800 ft. in length and 37 ft. high. The estimated cost of the dam will be $15,000,000. It is expected to develop about 200,000 hp. It is said that the Laclede Gas Light Company, of St. Louis, has contracted for 10,000 hp, and that the Union Electric Light & Power Company and the United Railways Company, of the same city, will take 50,000 hp between them. Hugh L. Cooper, New York, is the engineer of the development.

Detroit United Railways.—Pending the final settlement of the fare and franchise question between the Detroit United Railways Company and the city officials, efforts are being made to reach a temporary agreement. The company asks the city officials to let matters rest until the results of the inquiry being made by a committee of fifty are made known. The president of the company states that all of the profits at the present time are being used for betterments and extensions. It is likely that the city will insist that a reduced rate of fare be put into effect, at least on the lines upon which the franchises have expired. In return the city will grant the company the privilege of operating these lines until permanent franchises are secured.

Electrical Development in Utah.—A company has been organized in Salt Lake City to take over the electrical department of the Salina, Utah, Roller Mill & Electric Light Company and develop an extensive transmission proposition. The present plant of the company will be moved from Salina Canyon to a new site at Rattlesnake Hill. At this point a central station will be constructed of sufficient capacity to supply energy to towns adjacent to Salina as far north as Gunnison and as far south as Sigurd.

Electrical Construction.—Among the items printed under Construction Notes in our present issue are announcements of proposed new plants or considerable extensions of present plants at Lincoln, Neb.; Cleveland, Ohio; Greenwich, Conn.; Minneapolis, Minn.; Cheraw, S. C.; Frankfort, Ky.; Eldora, Col.; Vernon, Vt.; Valdosta, Ga.; Apalachia, Tenn.; San Benito, Tex.; Warren, N. H.; Hamilton, Ohio; Albemarle, N. C.; Leon, Ia.; Coshocton, Ohio; Chatham, Ont., Can., and Smithville, Mo.

New Suburban Railway Project Near Chicago.—The Hammond, Chicago Heights & Southern Traction Company has been chartered in Illinois to build an interurban electric railway from a point on the Illinois-Indiana State line near Hammond, Ind., to Chicago Heights and thence to Stanne, in Kankakee County, Ill. The capital stock is $500,000, and the incorporators are Messrs. William S. Reed, of Chicago; Andrew Ward, of Chicago, and others.

British Columbia Electric Railway Company.—Announcement has been made by the British Columbia Electric Railway Company, of Victoria, B. C., that it will extend its lines to many of the towns surrounding the city. Work has already been commenced on a new power plant on the Jordan River, which, it is expected, will be completed by Sept. 1. A large tract of land has been purchased for $750,000 in Victoria for terminal purposes.

Mitchell-Rand Manufacturing Company.—In a notice in these columns last week of the formation of a new company to take over the business of W. E. G. Mitchell—manufacturing insulating materials—the name was erroneously printed as "The Rand-Mitchell Company." The correct name is the Mitchell-Rand Manufacturing Company; the address is 88 Maiden Lane, New York.

Financial Intelligence.

THE WEEK IN WALL STREET.

Every trader in Wall Street agrees that the stock market is in a bad state of health. It is undeniably ill, but almost every doctor disagrees as to the exact cause of its ailment. For months it has been assumed that the tightened condition of the money market was responsible for the inactivity and sagging tendencies of the market. Now money is comparatively easy, and rates are almost down to the basis that prevailed last summer, and yet the market continues to be demoralized, and on Jan. 17, the last date under consideration in this review, was lower than it had been for the past three months. There is

no question that for six weeks there has been persistent liquidation. Holders of long stocks, both large and small, have displayed an anxiety to get out with profits. Many reasons have been assigned for this selling movement. One cause that has recently had a material effect is undoubtedly the heavy break in cotton. The majority of the Wall Street houses carry cotton accounts, and during the boom period of the cotton market many of their customers were tempted to abandon stocks for cotton. When the bull campaign in this staple collapsed, with heavy breaks within a few hours, there was necessarily a demand for margins and also the closing out of weak accounts. Another reason assigned for liquidation, which is also assigned for the present dullness in the investment market, is the unusually high cost of living. This necessarily curtails the savings of all classes, and leaves less surplus for investment and speculation. Added to this is the general uneasiness felt as to the course Congress will take with regard to the railroads and to industrial corporations. Money has been lower during the past week, and on Jan. 17 was quoted at: Call, 2½ @ 4 per cent; 90 days, 4 @ 4½ per cent. The quotations in the table are those of the close, Jan. 17.

NEW YORK.

	Jan. 10.	Jan. 17.	Shares sold.		Jan. 10.	Jan. 17.	Shares sold.
All.-Ch.	14½	14*	1,700	Int.-Met., pfd.	60⅛	61	97,100
All.-Ch., pfd.	53⅜*	50⅛	700	Mackay Cos.	90½*	85	300
Amal. Cop.	87¼	82¾	195,850	Mackay C., p.	78¼	77	600
Am. D. T.	20½*	20½*	———	Man. Elev.	137*	137	300
Am. Loc.	59	55¾	13,200	Met. St. Ry.	23	25*	314
Am. Loc., pfd.	114½*	113¾	———	N.Y.&N.J.Tel.	139¼*	139¼	———
Am. Tel & C.	77½*	76*	27	Steel, com.	87⅜	84	1,253,000
Am. T. & T.	139⅛	137½	16,198	Steel, pfd.	124	123	18,925
B. R. T.	78⅝	74⅝	47,205	W. U. T.	76¼	73½	4,253
Gen. Elec.	158½	154½	3,300	West'h., com.	81⅛	72	24,200
Int.-Met.,com.	24½	24	105,340	West'h., pfd.	128¼	128¼	100

PHILADELPHIA.

	Jan. 10.	Jan. 17.		Jan. 10.	Jan. 17.
Am. Rys.	49⅜	48	Phila. Elec.	14¼	14
Elec. Co. of A.	12⅜	12½*	Phila. R. T.	27½	25½
Elec. St. B'ty	62	61	Phila. Trac.	88½*	83¾
E. S. B'ty, pfd.	30*	30*	Union Trac.	52¼	51

CHICAGO.

	Jan. 10.	Jan. 17.		Jan. 10.	Jan. 17.
Chi. City Ry.	180*	180*	Chi. Tel. Co.	135	130
Chi. Rs., Ser. 1	107	107½*	Met. El., com.	17*	17*
Chi. Rs., Ser. 2	32½	31*	Met. El., pfd.	55	53¼
Com. Edison	121	120	Nat'l Carbon	111	108¾
Chi. Subways	4¾*	4⅞	Nat'l Car., pfd.	122½*	122½*

BOSTON.

	Jan. 10.	Jan. 17.		Jan. 10.	Jan. 17.
Am. T. & T.	140¼	137¾	Mex. Tel.	2¾*	3½
Cum. Tel.	143½	144*	Mex. Tel., pfd.	6*	6
Edison E. Ill.	247	243	N. E. Tel.	137	134½
Gen. Elec.	159	154½	W. T. & T.	17	16
Mass. E. Ry.	18	18½	W. T. & T., pfd.	94	93
Mass. E. R., pfd.	80	80			

* Last price quoted.
Shares sold are for week of Jan. 10 to Jan. 15.

Reorganization of Consolidated Traction Company, Chicago.—Plans for the reorganization of the Consolidated Traction Company, Chicago, and the formation of a new company to be known as the "United Railway Company," have been made public. The lines of the Consolidated company are to be placed in first-class condition, and undoubtedly the new company will be merged with the Chicago Railways Company at an early date, and it is quite probable that this in turn may be absorbed by the new Chicago City & Connecting Railways, which will include all surface street railways in the city. The Consolidated Traction Company is itself the result of the combination of a number of outlying street railways on the North Side and West Side of Chicago. To provide for the expenses of rehabilitating the system, an issue of 5 per cent first-mortgage bonds will be made. It is expected that these bonds will be issued to the amount of $6,000,000, of which $4,000,000 is to be expended on the North and Northwest sides, and $2,000,000 on the West Side. The properties of the Consolidated Company are now in the hands of J. M. Roach and David R. Forgan as receivers. The plan of reorganization was prepared by a committee consisting of Charles G. Dawes, E. K. Boisot, G. P. Hoover and others. The control of the new company is to remain for an indefinite period in the hands of the reorganization committee.

Copper Mergers Delayed.—The great copper merger, which for several months has been in process of negotiation between the Amalgamated Copper interests and other extensive interests, has been delayed from several causes. In the first place, the promoters desire to await the decision of the Supreme Court in the American Tobacco Company case. In the second place, the money market has not been favorable to the flotation of such a large lot of securities and, in the third place, it is thought better to get the metal market well in hand, on both sides of the Atlantic, before attempting to offer securities to the public. The smaller copper merger, by which the Utah Copper Company is to absorb the Nevada Consolidated Copper Company, has been held up by the protesting minority stockholders of the latter corporation. James Phillips, Jr., president of the company, is leading an active campaign against the consolidation proposed by the Guggenheims.

Morgan in Control of Telephones.—J. P. Morgan & Company last week took control of the United States Telephone Company and its subsidiary corporations. James S. Brailey, Jr., was replaced as president by Frank A. Davis, of Columbus, Ohio, as was stated in our last issue. In addition to that five new directors who sold their stock to Morgan interests resigned from the board, and in their place were elected: F. W. Stevens, of J. P. Morgan & Company; E. R. Sharp, secretary-treasurer, State Savings Bank & Trust Company, of Columbus; F. R. Huntington, of the Huntington National Bank, Columbus; Harry M. Daugherty, Columbus; F. L. Beam, Mt. Vernon, Ohio, president of the Ohio Independent Telephone Association, and N. Monserrat, president of the Hocking Valley Railroad.

Reedy River Power Company.—Peabody, Houghteling & Company, Chicago, are offering to the public at 102½ and interest, $125,000 of first mortgage 5 per cent bonds of the Reedy River Power Company, of Laurens, S. C. These bonds mature in yearly installments from Oct. 1, 1910, to Oct. 1, 1919. According to the circular issued by the firm, these bonds are secured by a closed first mortgage upon all the property now owned and that may be acquired hereafter by the company. The Reedy Company owns the entire water rights at Boyd's Mill on the Reedy River. The actual cash value of the company's plant, without including any valuation for the water rights, is $220,893, and it is estimated that the net earnings will be almost five times the interest charges.

Postal Telegraph Changes Name.—Application has been made to the Supreme Court for permission to change the name of the Postal Telegraph-Cable Company of New York to the Transcontinental Telegraph Company. This is in line with the plan for changing names which was published in our issue of Dec. 23, 1909. The New England Telegraph Company owns the lines and apparatus in use in New York State. The name of this company has been changed to the Postal Telegraph-Cable Company of New York, so that the operation of the lines will be under the same corporate name as the ownership. As there was already a corporation called the Postal Telegraph-Cable Company, the change to Transcontinental was made necessary.

Kansas City Railway & Light Company.—The management of the Kansas City Railway & Light Company is maturing plans for refunding the bonds which will soon become due. The franchise of the company runs until 1925, but some of the bonds mature prior to that date, and further financing must be done along different lines from those contemplated when the extension of the company's franchise was asked and refused. The extension of the franchise was asked so long in advance, in order to enable the company to refinance its bonded indebtedness at a reasonable rate of interest.

Thomasville (N. C.) Light & Power Company.—The announcement was made at the recent meeting of the Thomasville (N. C.) Light & Power Company that a controlling interest in the company had been purchased by Frank H. Fleer, the Philadelphia chewing gum manufacturer, and F. W. Bryant, general manager of the company. Mr. Fleer has been elected president; general manager, F. W. Bryant, and secretary and treasurer, J. C. Bryant.

Philadelphia Rapid Transit Changes.—Walter Ellis, general superintendent of the Philadelphia Rapid Transit Company since 1895, has resigned his position and will be succeeded by M. F. Ryan, now assistant general superintendent. S. G. Moore, superintendent of the Willow Grove division, will succeed Mr. Ryan. Mr. Ellis will continue to be attached to the president's office.

American Light & Traction Company.—Benjamin Strong, Jr., vice-president of the Bankers Trust Company, of New York, has been elected to the board of directors of the American Light & Traction Company, to succeed the late George P. Sheldon. James M. McCarthy, of Quebec, was elected to the executive committee to succeed Mr. Sheldon.

London (Ont.) Electric Company.—The annual report of the London (Ont.) Electric Company for the year ended Nov. 30, 1909, shows total assets of $685,076. The surplus for the year, after paying all fixed charges, was $52,667.

Butte Electric & Power Company.—The year 1909 is said to have been the most favorable, as far as earnings are concerned, in the history of the Butte (Mont.) Electric & Power Company. The gross earnings of the company for the year, with December partially estimated, were in the neighborhood of $1,660,000, about $1,000,000 of which will show up in the report as net earnings. On this basis there will be left something like 17¼ per cent available for dividends on the $3,500,000 of common stock outstanding. The company is now paying 5 per cent on its preferred shares, and at the rate of 6 per cent on its common shares. The operating officials of the company say that the demand for power is steadily increasing, and that at the present time not more than one-half of its gross earnings are derived from mining enterprises. It is claimed that the demand for other purposes than mining is constantly increasing. At the present time the power plants owned by the company and its subsidiaries have a capacity of 27,400 hp, of which 23,700 hp is hydroelectric. About 21,000 additional hydroelectric horse-power is in process of development.

Keystone Telephone Company.—At the annual meeting of the Keystone Telephone Company, of Philadelphia, President Nathan T. Folwell announced that it was probable that the company would begin to pay dividends upon the preferred stock next fall. He said that during the calendar year of 1909 additions to the underground plant, including additions to cable lines and equipment, had been made to the extent of $195,375; the net earnings during the year had been $533,000, and the surplus, after paying fixed charges, $246,500, which was $30,7000 more than the previous year. Business, he said, had been increased 25 per cent, and the business was steadily improving.

To Sell Kentucky Telephone Companies.—The United States District Court of Kentucky has ordered the sale of the properties of the Paducah Home Telephone Company and the Kentucky-Indiana Telephone & Telegraph Company. The sales are ordered as the result of foreclosure suits brought by the bondholders. The former company has outstanding $250,000 bonds and the latter $162,000. These independent companies were controlled by the Central Home Telephone Company, of Louisville, which went into the hands of J. D. Powers as receiver in August, 1908.

Western Electric Mortgage.—The Western Electric Company has filed a mortgage for $15,000,000 in New York City to the Merchants Loan & Trust Company. The mortgage covers all of the property of the company in the city. This mortgage is to secure the issue of $5,000,000 of bonds which heretofore have been referred to.

Portland (Ore.) Gas Company Sale.—The Portland (Ore.) Gas Company has been sold to a new organization known as the Portland Gas & Coke Company. The consideration is said to have been about $4,000,000. The purchasing company is an offshoot of the Electric Bond & Share Company, which in turn is owned by the General Electric Company.

Vincennes (Ind.) Traction & Light Company.—The Vincennes Traction & Light Company, constructing a suburban line, 10 miles long, in Indiana, has filed notice with the Secretary of State that its capital stock had been reduced from $200,000 to $500. The road is largely owned by Louisville, Ky., capitalists.

Animosa-Oxford Junction (Ia.) Light & Power Company—The Oxford Junction Light, Power & Mill Company, of Oxford Junction, Ia., has changed its name to the Animosa-Oxford Junction Light & Power Company, and the capital stock has been increased from $50,000 to $250,000.

DIVIDENDS.

American District Telegraph Company, quarterly, 1 per cent, payable Jan. 22.

Butte Electric & Power Company, preferred, quarterly, 1¼ per cent, payable Feb. 1.

Cambridge, Mass., Electric Light Company, quarterly, 2½ per cent, payable Feb. 1.

Columbus, Ohio, Street Railway Company, preferred, quarterly, 1¼ per cent, payable Feb. 1.

Electric Company of America, semi-annual, 3½ per cent, payable Feb. 3.

Grand Rapids, Mich., Railway Company, preferred, quarterly, 1¼ per cent, payable Feb. 1.

Havana Electric Company, quarterly, preferred 1½ per cent, common 1 per cent, both payable Feb. 14.

Michigan State Telephone Company, preferred, quarterly 1½ per cent, payable May 1; common, quarterly, 1½ per cent, payable March 1.

Montreal Street Railway Company, quarterly, 2½ per cent, payable Feb. 1.

Omaha Electric Light & Power Company, preferred, semi-annual, 2½ per cent, payable Feb. 1.

Pacific Gas & Electric Company, preferred, quarterly, 1½ per cent, payable Feb. 15.

Railways Company General, quarterly, 1 per cent, payable Feb. 1.

Railway & Light Securities Company, Boston, common, initial, 2 per cent, payable Feb. 1.

United Gas & Electric Company, of New Jersey, preferred, semi-annual, 2½ per cent, payable Jan. 15.

United Traction Company, Pittsburgh, preferred, semi-annual, 2½ per cent, payable Jan. 20.

Western Telephone Company, preferred, semi-annual, 2½ per cent, payable Feb. 1.

REPORTS OF EARNINGS.

	Gross earnings.	Expenses.	Net earnings.	Charges.	Surplus.
Associated Bell Operating Companies:					
November, 1909	$11,788,696	$8,413,661	$3,375,035	$632,737	$2,742,298
November, 1908	10,769,662	7,459,052	3,310,610	623,638	2,686,472
Capital Traction Company, Washington, D. C.:					
Year 1909	2,024,484	918,373	1,106,111	293,024	842,381
Year 1908	1,831,810	793,141	1,038,669	290,947	771,886
Dallas, Tex., Electric Corporation:					
November, 1909	121,215	68,780	52,434	24,137	28,297
November, 1908	105,194	66,354	38,839	25,061	13,777
Fort Wayne (Ind.) & Wabash Valley Traction Company:					
November, 1909	123,650	69,770	53,880	——	——
November, 1908	111,794	58,996	52,798	——	——
Galveston-Houston Electric Company:					
November, 1909	109,057	61,245	47,812	20,236	27,575
November, 1908	104,446	59,593	44,853	18,271	26,582
Keystone Telephone Company:					
Six months ended Dec. 31, 1909	551,052	274,084	276,968	183,941	93,018
Six months ended Dec. 31, 1908	528,237	261,778	266,459	206,978	59,480
Lehigh Valley Traction Company:					
Year ended Nov. 30, 1909	956,888	548,172	408,716	421,602	101,688
Year ended Nov. 30, 1908	910,574	561,240	349,334	420,783	56,602
Lowell (Mass.) Electric Light Corporation:					
November, 1909	35,041	16,652	18,389	3,582	14,807
November, 1908	33,328	17,231	16,096	2,992	13,104
Minneapolis General Electric Company:					
November, 1909	105,361	39,725	65,636	31,670	33,965
November, 1908	103,750	40,112	63,637	33,444	30,193
Northern Ohio Traction & Light Company:					
Year 1909	2,177,642	1,190,057	987,585	524,066	463,519
Year 1908	1,890,473	1,086,424	804,049	526,532	277,517
Oregon Electric Railway Company, Portland, Ore.:					
November, 1909	34,785	22,824	11,961	——	——
November, 1908	21,984	16,051	5,933	——	——
Puget Sound Electric Railway Company:					
November, 1909	139,017	97,506	41,510	44,830	*3,319
November, 1908	132,351	89,882	42,469	39,491	2,977
Savannah Electric Company:					
November, 1909	51,088	33,516	17,571	15,888	1,683
November, 1908	54,948	34,193	20,756	15,899	4,855
United Railroads, San Francisco:					
November, 1909	619,313	352,570	266,743	——	——
November, 1908	574,522	316,333	258,189	——	——

* Deficit.

General News

Construction News.

BIRMINGHAM, ALA.—The Jefferson Iron Company is reported to be in the market for equipment for an electric-light plant with sufficient output to supply from 500 to 600 incandescent lamps of 16 cp.

ARKANSAS CITY, ARK.—It is reported that the city is prepared to grant a franchise for an electric light plant. For further information address Vernon MacCammon, secretary of Business Men's League.

VAN BUREN, ARK.—A telephone company has been organized in Van Buren for the purpose of constructing a telephone line north from this place. Robert Alfred is manager.

ALAMEDA, CAL.—The City Council is considering the question of removing the municipal electric light plant from the south end of Park Street to the north end of Grand Street. If it is decided to move the plant a new building will be erected at a cost of about $25,000 and new machinery and equipment installed at an expense of $100,000.

BAKERSFIELD, CAL.—Contracts will be awarded by the Power Transit & Light Company for the construction of four miles of new track in the near future. Harry A. Jastro is purchasing agent.

CHICO, CAL.—The City Trustees have awarded the contract for lighting the streets and public buildings to the Pacific Gas & Electric Company for one year. Under the terms of the contract the company is to furnish arc lamps at $84 each per year and 16-cp incandescent lamps at $6.61 per lamp per year.

COALINGA, CAL.—S. W. Morshead is reported to be interested in a project to construct an electric railway from Coalinga to Orrs, where connection will be made with the Southern Pacific Railroad.

COVINA, CAL.—Preliminary steps are being taken by the Covina Home Telephone Company to increase its capital stock from $50,000 to $200,000.

HUNTINGTON PARK, CAL.—Bids will be received by the Board of Trustees of the Huntington Park Union High School until Jan. 24 for the construction of a polytechnic or manual arts building and furnishing machinery for same, including engine and dynamo, planer, joiner, band saw, iron lathes, tool sharpener or grinder, combination rip and cross saw, with bench, wood and iron-working tools, metal hammers, wood and iron borer and wood trimmer; each machine to have a motor attached. Norman F. Marsh, Central Building, Los Angeles, Cal., is architect. J. G. Shea, clerk.

LOMPOC, CAL.—The question of establishing a municipal electric light plant in Lompoc is under construction. A committee has been appointed by the City Council to investigate the matter and report at the next meeting of the Council.

LOS ANGELES. CAL.—The contract for lighting the streets of the city for one year was awarded by the Board of Public Works to the Los Angeles Gas & Electric Company. The contract amounts to about $220,000 per year.

LOS ANGELES, CAL.—The Southern California Edison Company has filed a mortgage with the County Recorder to secure an issue of bonds to the amount of $30,000,000, of which the proceeds of $12,000,000 will be used to retire the bonds of the Edison Electric Company, and $18,000,000 will be used for extensions, improvements and future developments.

PALMS, CAL.—The People's Water Company is considering the question of forming a stock company to establish an electric plant to furnish electricity for lamps and also to install a telephone exchange and system.

PASADENA, CAL.—Bids will soon be called for by the Board of Trustees of South Pasadena for the erection of ornamental lamp posts on Fair Oaks Avenue and Mission Street, the cost to be paid by property owners.

REDDING, CAL.—The Mountain Copper Mining Company has recently closed a contract with the Northern California Power Company for the construction of a new transmission line from Redding to Keswick, the cost of which is estimated at about $150,000.

SAN BERNARDINO, CAL.—A movement is on foot to establish a municipal electric plant in San Bernardino. It is expected that the question will be presented to the City Council in the near future.

SAN FRANCISCO, CAL.—The Board of Supervisors has ordered the construction of incinerating plants, the cost not to exceed $300,000. It is reported that an electric power plant will be installed in connection with the incinerating plant, and, besides the special furnaces required, bids will be taken on boilers, steam turbines, turbo-generator sets, superheaters, pumps, etc.

SEBASTOPOL, CAL.—It is stated that contracts have been awarded by the Russian River Light & Power Company for the construction of a high-tension transmission line from Sebastopol, extending north to Russian River and thence to Duncan's Mills and from there to Occidental. Work will commence at once on erection of the line, and it is expected that the company will be able to furnish electrical service to all of the resorts along the Russian River and to farmers along the route between Forestville and the river during the coming summer. John E. Bennett, of San Francisco, Cal., is president of the company.

VISALIA, CAL.—As previously noted the Consolidated Heat, Light & Power Company has sold its electric lighting business to the Mt. Whitney Power Company, the first mentioned company retaining its gas business. About seven years ago the Consolidated company shut down its steam plant and contracted with the Mt. Whitney Company for electrical energy at a wholesale rate, but last year the latter company served notice that when the contract expired (on October 24, 1909) it would wire the town and supply electricity direct. The sale was made at a nominal figure.

WEED, CAL.—Arrangements are being made by the Weed Lumber Company to drive a large part of its machinery with electric motors. Orders have been placed by the company with the Allis-Chalmers Company, Milwaukee, Wis., for a 750-kw, 3600 r.p.m., 60-cycle, three-phase, 600-volt, condensing steam turbine unit to generate electricity to operate the plant.

BOULDER, COL.—Surveys are being made for the construction of a hydroelectric power plant, which will utilize the water power of Left Hand and Jain Creeks. The power station will be located a short distance below where the streams unite. It is said that sites have been obtained and that work will commence on construction of the plant early in the spring. It is understood that about 1000 hp will be developed, which will be utilized in the mining properties in the district tributary to the proposed plant. George W. Teal is interested in the project.

ELDORA, COL.—The Highland Power Company, recently incorporated, is contemplating the construction of a large hydroelectric power plant on the west branch of middle Boulder Creek above Eldora, this spring, which will involve an expenditure of about $1,000,000. The company will take over the holdings of the Highland Mary Mining & Milling Company and proposes to supply electricity for mining, agriculture and domestic purposes. The company is capitalized at $3,000,000. The directors are: J. H. Bair, president; H. O. Andrew, H. W. Brougher, E. A. Austin, J. E. Slothower and J. Frank Turner.

GAYLORDSVILLE, CONN.—The capital stock of the New Milford Power Company has been increased from $35,000 to $100,000. Plans are being prepared by the company for improvements and extensions to the plant.

GREENWICH, CONN.—Plans are being considered for changing the present street lighting system from arc to tungsten lamps. It is proposed to replace each arc lamp with four tungsten lamps. The price paid for arc lamps is $100 each per year, while the new lamps will cost $24 per lamp per year. The present street lighting contract will expire this month. Electricity for operating the system is furnished from the power house on Steamboat Road. It is understood that the Connecticut company proposes to erect a new power house and install new equipment at the Steamboat Road plant immediately.

LAUREL, DEL.—The Sussex Light & Power Company, which recently took over the plant of the Laurel-Seaford Electric Company, will be in the market about April 1 for a 300-kw generator and a 450-hp tandem-compound engine with jet condenser. Charles C. Stephenson is manager.

FORT MYERS, FLA.—The Seminole Power & Ice Company is contemplating the installation of a 200-hp boiler to replace the present one, rated at 60 hp.

MARIANNA, FLA.—At a recent election the citizens voted to issue $10,000 in bonds, the proceeds to be used for the consolidation and enlargement of the electric light plant and water-works system.

BRUNSWICK, GA.—The Brunswick Terminal & Railway Securities Company has taken over the Mutual Light & Water Company and the City & Suburban Railway Company. The Brunswick Terminal & Railway Securities Company is successor to the Brunswick City Dock & Improvement Company and is capitalized at $10,000,000. It is said that the company is not simply a holding company, but will take an active part in the development of Brunswick and vicinity and will co-operate in the construction of the proposed Georgia Coast & Piedmont Railway Company's railway from Darien to Brunswick, Ga.

JACKSON, GA.—An option has been secured on a large tract of land on the outskirts of the town, where it is understood that a million-dollar textile manufacturing plant, to be electrically driven, will be erected by New York and Boston capital. W. Jordan Massee, president of the Central Georgia Power Company, is interested in the new enterprise. The hydroelectric development on the Ocmulgee River is progressing rapidly, and 20,000 hp will soon be available.

LAVONIA, GA.—The City Council has awarded contract for construction of electric light and power plant to Charles P. Edwards and W. N. Edwards; a concrete dam will be erected at Parker's Mill, where it is estimated that a minimum of 100 hp can be developed. The contract for installing machinery and erecting transmission line from power plant to Lavonia, and wiring the town has been awarded to the General Electric

Company, Southern office, Empire Building, Atlanta, Ga. It is expected to have the plant completed by May 1, 1910.

VALDOSTA, GA.—Two 20-year franchises have been granted by the City Council to two companies in this city for lighting, heating and power privileges, for which each company is to pay the city the sum of $6,000. One of the franchises was purchased by the Valdosta Ice & Manufacturing Company, which has been operating in Valdosta for about 20 years, and the other by a new company, being formed by G. W. Varn and associates, which it is understood will be known as the Consolidated Ice & Power Company. It is said that the new company will expend about $100,000 in electric equipment and will commence work on its plant in the near future. The City Council has awarded a five-year contract to the Valdosta Ice & Manufacturing Company for street lighting, under the terms of which the company will furnish 80 arc lamps at the rate of $62.50 each per year, which is a reduction of $12.50 per lamp on the former contract.

WILLACOOCHEE, GA.—It is reported that the installation of a lighting system in Willacoochee is under consideration. J. E. Gaskins is Mayor.

WALLACE, IDAHO.—The Lead Silver Mining Company, it is said, is contemplating the installation of considerable electrical equipment in the near future.

AURORA, ILL.—The Chicago, Aurora & De Kalb Railroad Company is planning to equip 30 miles of track to be operated by electricity. W. C. Cram, Jr., is general manager.

DUNDEE, ILL.—The Illinois Lakes Light, Heat & Power Company is reported to have been granted a franchise in West Dundee for the distribution of electricity in that town until April, 1922. The company has also secured a contract for street lighting until November, 1912. The franchise was granted to the Dundee Electric Light Company, and the renewal of the lighting contract made with the Citizens Light, Heat & Power Company. Both companies are owned by the Illinois Lakes Light, Heat & Power Company.

ELGIN, ILL.—The City Council has adopted plans to utilize the surplus earnings of the city water department for the erection of an electric power plant to furnish electricity for lighting the city and operating the pumping plant. It is estimated that the surplus of five years will be sufficient to build the plant.

FITHIAN, ILL.—The question of establishing an electric light plant and water-works system in Fithian is under consideration.

LE ROY, ILL.—The Le Roy Electric Light, Power & Heating Company expects to establish a day service for lamps and motors next summer, and also proposes to establish an ice plant in connection with its electric plant. L. W. Wartena is president and manager.

OLNEY, ILL.—W. W. Gray, treasurer of the Olney Electric Light & Power Company, writes that it is expected to have the plant completed and in operation in about 60 days. The equipment of the plant includes two 370-kw, 1150-volt, three-phase, 60-cycle General Electric generators direct-connected to two 480-hp Bates engines, with direct-connected exciters, and three 700-hp Heine-Root boilers and motor-driven boiler feeder.

PORT BYRON, ILL.—Plans are being considered by the Crescent Telephone Company for rewiring its entire system during the coming year.

SPRINGFIELD, ILL.—The deep waterway bill advocated by Governor Deneen was passed by the Senate January 12. This measure provides for beginning work on the canal from Lockport to Utica at once. The bill includes the proposition to construct water power plants, this power to be used for the purpose of paying the interest on the $20,000,000 bond issue and the ultimate retiring of the bonds.

BROOKSTON, IND.—Surveys are being made for locating a route for an interurban railway from Battle Ground to Reynolds by the way of Brookston, 24 miles in length. It is said that the Ft. Wayne & Wabash Valley Traction Company, which operates the Battle Ground, is interested in the project.

COLUMBUS, IND.—The old power plant of the Central Indiana Lighting Company will be dismantled within a few weeks and the new plant put into operation. The new plant is now furnishing electricity for commercial lighting. The motor service will be changed from direct to alternating current, which will require a change in motors used. A 500-kw, direct-current generator is now being installed to furnish electricity for the local street car service.

FRANKLIN, IND.—It is reported that the Franklin Water, Light & Power Company is contemplating rebuilding its electric light and power plant. Definite plans have not yet been decided upon or engineer engaged.

HAMMOND, IND.—The Board of Public Works is reported to have rejected the bids submitted for lighting the city by the Northern Indiana Gas & Electric Company and the South Shore Electric Railway Company, owing to the bids being too complicated. It is understood that the board will readvertise.

HARLAN, IND.—Work has commenced on grading of the proposed electric railway of the Fort Wayne & Toledo Electric Railway Company between Fort Wayne and Harlan, Ind., Hicksville, Farmer, Bryan, Toledo and Montpelier, Ohio, 55 miles in length. Franchises are being secured from the different municipalities. R. T. Bastress, of Harlan, Ind., is general manager.

KENDALLVILLE, IND.—Plans are being prepared by the Home Telephone Company for improvements to its local system, which will include remodeling of the exchange building, extension of telephone lines and installation of considerable new equipment.

LA PORTE, IND.—The capital stock of the La Porte Electric Company has been increased from $150,000 to $200,000, the proceeds to be used for installation of new equipment and other improvements to its system. E. D. Bosworth is president.

NEW CASTLE, IND.—The Indianapolis, New Castle & Toledo Traction Company has recently installed two turbo-generator sets in its power plant in New Castle. It is expected that the railway will be ready for operation in the near future.

KEOKUK, IA.—Announcement has been made that the syndicate which proposes to develop the water power of the Mississippi River at Keokuk, Ia., has financed its project and that work will soon commence on the construction of the dam. The dam will be 5800 ft. in length and 37 ft. in height and will develop about 200,000 hp. The cost of the dam is estimated at $15,000,000, which will be built under the supervision of the War Department. It is said that three St. Louis corporations have already contracted for 60,000 hp, the Laclede Gas Light Company taking 10,000 hp, the Union Electric Light & Power Company and the United Railways dividing 50,000 hp. Hugh L. Cooper, 60 Wall Street, New York, N. Y., is engineer.

LEON, IA.—The Leon Electric Light Company has secured a franchise in Decatur City, about five miles distant, and will commence work on construction of a transmission line to that city about March 1. The company is also planning to install a 100-kw, 2300-volt, three-phase, 60-cycle alternator and 200-hp Corliss engine. The present direct-current service will be retained. Samuel C. Johnston is secretary and manager.

OXFORD JUNCTION, IA.—The Oxford Junction Light, Power & Mill Company, of Oxford Junction, Ia., has changed its name to the Animosa-Oxford Junction Light & Power Company, and the capital stock increased from $50,000 to $250,000.

GARNETT, KAN.—Preparations are being made by the Garnett Electric Light Company to move its plant and consolidate it with the McAfee Manufacturing Company's plant, when a 24-hour service will be established. New three-phase generators will be installed. J. Q. McAfee is treasurer and manager.

STAFFORD, KAN.—The City Council is contemplating the purchase of the local electric light plant. An appraisal of the plant has been made by the J. S. Worley Company, engineers, Reliance Building, Kansas City, Mo.

FRANKFORT, KY.—We are informed that the Capitol Gas & Electric Company will award contract for a 500-kw turbine in the spring. H. D. Fitch, of Bowling Green, Ky., is engineer.

LOUISVILLE, KY.—The capital stock of the George G. Fetter Lighting & Heating Company has been increased from $150,000 to $200,000.

LOUISVILLE, KY.—Judge Evans, in the Federal Court, has ordered the sale of the plant and holdings of the Paducah Home Telephone Company and the Kentucky-Indiana Telephone & Telegraph Company to satisfy creditors. The mortgage indebtedness of the Paducah Company is $250,000 and of the last named company $162,000. J. D. Powers was appointed special commissioner and will designate the date of the sales.

PAINTSVILLE, KY.—G. A. Northcott, of Huntington, W. Va., is interested in a project to establish an electric-light plant and water-works system in Paintsville, Ky., at a cost of about $40,000.

CROWLEY, LA.—Plans are being prepared for the installation of a new electric light system and water works to replace the temporary plant now in operation. The present plant does not supply electricity for street lamps. It is expected that the City Council will soon call an election to submit the proposition of bonding the city for a new plant. Walter B. Reid, of New Orleans, La., is consulting engineer.

NEW ORLEANS, LA.—The New Orleans Railway & Light Company has awarded a contract to the Jefferson Construction Company, of New Orleans, La., for the construction of a fireproof substation in this city.

BALTIMORE, MD.—Bids will be received until Jan. 26 by the Board of Awards at the office of the City Register, City Hall, Baltimore, Md., for furnishing cast-iron electric-light posts and bench legs for the Park Board in accordance with plans and specifications on file at the office of the Board of Park Commissioners, Madison Avenue entrance to Druid Hill Park, Baltimore, Md. William S. Manning is general superintendent.

HAGERSTOWN, MD.—Arrangements are being made by the Security Cement & Lime Company for the installation of a low-pressure steam turbine. An order has been placed with the Allis-Chalmers Company for a 750-kw, 3600 r.p.m., 60-cycle, three-phase, 480-volt, low pressure, steam turbine.

GREENDALE, MASS.—The Connecticut River Transmission Company has entered into a contract with the Bradley Car Company to furnish electricity for the new plant, which the Bradley company proposes to erect in Greendale. The contract calls for a maximum of 900 kw per year with an average of more than 700 kw for five years.

HYDE PARK, MASS.—The State Gas and Electric Light Commissioners has given its approval of an issue of 435 shares of new stock of the Dedham & Hyde Park Gas & Electric Company at $60 per share, the proceeds to be used for additions to its plant.

MIDDLEBORO, MASS.—The Municipal Light Commissioners have decided to extend the lighting service to North Middleboro, a distance of about five miles, if sufficient business is guaranteed to pay for extending the line. The village has had electric street lamps for several years.

NORTH ADAMS, MASS.—A new electric power plant has been installed by M. T. Stevens & Sons to furnish electricity for lamps and operating the Osgood mill.

SPRINGFIELD, MASS.—We are informed that bids for heating and ventilating, electric work and plumbing for the auditorium, tower and passage and municipal office building of the new municipal buildings to be erected on Court Street, Springfield, Mass., have been rejected, and that new bids will be called for. George Dwight Pratt is chairman of municipal building commission.

WESTFIELD, MASS.—The stockholders of the Westfield Power Company on Jan. 12 voted to increase the capital stock of the company from $82,500 to $100,000. George E. Dunbar is manager.

ESCANABA, MICH.—We are informed that the Escanaba Power Company is contemplating the construction of another dam this year. The company furnishes electrical energy for operating the Escanaba municipal electric plant and the Escanaba Electric Street Railway Company's system and also furnishes electricity in Gladstone and Wells, Mich. P. L. Utley is president and manager.

GRAND RAPIDS, MICH.—It is reported that in addition to the machinery recently purchased for the new municipal electric plant in Grand Rapids, Mich., another electric generating unit, together with auxiliary apparatus, is required, bids for which will be called for in the near future.

GRAND RAPIDS, MICH.—Application has been made to the State Railway Commission to approve plans for the issuance of $100,000 in capital stock for the organization of the Michigan Independent Telephone and Traffic Association, of Grand Rapids, for the purpose of leasing, controlling and constructing toll lines and telephone exchanges in Grand Rapids, Muskegon, Detroit and several other cities in Michigan, where so-called independent telephone companies have been organized.

HANCOCK, MICH.—The Michigan State Telephone Company is contemplating the erection of five new trunk telephone lines to Calumet, and two to Lake Linden.

HOUGHTON, MICH.—The Osceola Consolidated Mining Company is installing additional electrical equipment and is contemplating the purchase of a compressed-air outfit.

REED CITY, MICH.—Improvements are being made to the power plant of Osceola Light & Power Company, including the installation of three new horizontal turbines. The company will establish a day service about June 1, 1910. H. L. Millspaugh is secretary and manager of the company.

AURORA, MINN.—The City Council is reported to be considering the question of establishing a municipal electric light plant.

GLENCOE, MINN.—The Glencoe Electric Light Company is changing its system from direct current to alternating current, three-phase, 2300 volts. G. C. Greene is secretary and manager.

MINNEAPOLIS, MINN.—The Northern Heating & Electric Company is reported to have abandoned its attempt to secure a franchise in Minneapolis, for the present.

MINNEAPOLIS, MINN.—Bids will be received at the office of the Board of Charities and Corrections, City Hall, Minneapolis, Minn., until January 25 for an automatic high speed engine, arranged for direct connection to an electric generator, and one engine type electric generator, together with switchboard apparatus for same and conduit and cable connections between generator and switchboard panel, to be installed in the City Hospital, Minneapolis, Minn., according to plans and specifications prepared by Charles L. Pillsbury, engineer, Metropolitan Life Building, Minneapolis, Minn. Richard Tattersfield is secretary.

RUSH CITY, MINN.—C. M. Johnson, secretary and manager of the Rush City Electric Light Company, writes that the company has sold the entire street lighting outfit to the Pine City Power Company. He also states the company has for sale a 50-kw Northern generator direct-connected to a 100-hp Ideal engine.

RULEVILLE, MISS.—The plant of the Ruleville Light, Ice & Coal Company, which was recently destroyed by fire, will be rebuilt. It is said that machinery with greater output will be installed.

KANSAS CITY, MO.—The Union Pacific Railroad Company is contemplating the installation of new electric interlocking plants at seven places in Kansas City.

OZARK, MO.—The Water Power Light Company is contemplating increasing its capital stock and issuing bonds, the proceeds to be used to retire present indebtedness and provide funds for extensions which will double the output of the plant within the next 18 months. S. E. Bronson is secretary and manager.

ST. LOUIS, MO.—The Bemis Bag Company, of St. Louis, Mo., it is said, will soon purchase machinery for its new factory, including a Corliss engine, generator, boilers, pumps, etc.

SLATER, MO.—Plans are being considered for enlarging and improving the municipal electric-light plant. As yet nothing definite has been decided upon. L. E. Shepherd is manager.

SMITHVILLE, MO.—The Smithville Electric Light Company is contemplating rebuilding its plant and removing the power house to the center of the town; installing a crude-oil engine and a 60-cycle, alternating-current generator, and also erecting a transmission line to Edgerton, Mo., to furnish electrical service in that town. Harry Gordon is manager.

KALISPELL, MONT.—It is reported that W. H. Griffin and others, of Kalispell, Mont., are organizing a company for the purpose of constructing electric lines from Kalispell to rural communities. The company will be capitalized at $50,000.

AUBURN, NEB.—The Auburn Mutual Lighting & Power Company is extending its transmission lines, using concrete poles. C. A. Snider is manager.

LINCOLN, NEB.—The Lincoln Traction Company has recently purchased a 500-kw, 3600 r.p.m., 60-cycle, three-phase, 2300-volt, condensing steam turbo-generator from the Allis-Chalmers Company, Milwaukee, Wis.

LINCOLN, NEB.—Plans are being considered by the City Council for extensions and improvements to the municipal electric light plant, which will involve an expenditure of about $32,500. It is proposed to increase the output of the plant to enable the city plant to furnish electricity for commercial lighting. The power station will be enlarged and additional machinery, including another generator, will be installed.

OMAHA, NEB.—The Nebraska Traction & Power Company is contemplating the purchase of a rotary converter. W. D. Crist is manager.

WILBER, NEB.—The managers of the municipal electric-light plant are planning to establish a day service in the spring. E. E. Dunder is superintendent.

CONCORD, N. H.—Surveys are being made from Concord to Salisbury, a distance of 24 miles, and from Salisbury to Kannapolis, with a view of connecting Concord, Salisbury and Kannapolis with an electric interurban railway. T. H. Vanderford, of Salisbury, who is interested in the Concord street railway system, is interested in the project.

WARREN, N. H.—Plans are being prepared by the Warren Water & Light Company to remove its power plant from Warren to Wentworth, N. H., four miles distant, during the coming year, where it is proposed to develop a water power to operate the plant. The company will supply electricity in the towns of Warren, Wentworth and Rumney for lamps and motors. Edgar S. Carbee is treasurer and manager.

WASHINGTON, N. J.—Arrangments are being made by the Easton & Washington Traction Company to extend its railway from Port Murray, the present terminus, to Hackettstown, and thence to Lake Hopatcong, where it will connect with the Morris County Traction Company.

BUFFALO, N. Y.—The electric lighting plant for the city hall is nearly completed and will soon be put into operation.

BUFFALO, N. Y.—It is reported that plans are being prepared by the Cleveland Engineering Company for a large power plant for the new technical school in Buffalo, the equipment of which will include furnaces with mechanical stokers, tubular boilers, two Corliss engines, with a total rating of 500 hp; electric generators, heaters, pumps, motors, etc.

NEW YORK, N. Y.—The Public Service Commission, First District, has approved of the franchise recently granted to the New York & Queens County Railway Company by the Board of Estimate for the operation of its cars from Jackson Avenue, Long Island City, over the Queensboro Bridge.

NEW YORK, N. Y.—The Public Service Commission, First District, has authorized the Bronx Gas & Electric Company permission to issue bonds to the amount of $643,000, for the purpose of retiring $500,000 now outstanding and for improvements. The company originally applied for permission to issue $1,500,000, of which it proposed to use $740,000 in bonds to retire the $500,000.

ROSLYN, N. Y.—Plans have been filed by the New York & North Shore Traction Company for a power plant to be located on Albany Creek north of Broadway in Douglaston. The plant will cost about $90,000 and will furnish electricity for the railway from Manhasset to Whitestone. C. H. Clark, of Roslyn, is chief engineer.

SAYVILLE, N. Y.—The Sayville Electric Company is contemplating increasing its boiler plant. C. N. Aldrich is manager.

SCHENECTADY, N. Y.—The bid of the Schenectady Illuminating Company for furnishing electricity for lighting the city for a term of five years has been accepted by the Board of Contract and Supply. Under the terms of the contract the rate for arc lamps will be $60 each per year, and 5 cents per kw-hour for electricity for lighting the public buildings.

ALBEMARLE, N. C.—The Town Council has sold $20,000 in bonds, the proceeds to be used for the construction of a municipal electric-light plant and make other improvements. The town has been negotiating with the Southern Power Company for electrical service for street lighting, but the prospects are now that the town will install its own plant. Local cotton mills will secure electricity from the Southern Power Company, which it is expected will be available by Feb. 1. The municipal plant will be ready by April 1.

BENSON, N. C.—It is reported that a movement is on foot to establish an electric-light plant in Benson.

CHARLOTTE, N. C.—The Charlotte Power Company, chartered under the laws of New Jersey, has been admitted to this State, with offices in Charlotte. The company proposes to own and operate street railways, lighting plants, furnish electricity and water power. The company is capitalized at $300,000. W. S. Lee, of Charlotte, is president.

MONROE, N. C.—The owners of the Monroe Cotton Mills have decided to abandon steam power and use electricity to operate the mills. The company has contracted with the Southern Power Company, of Charlotte, N. C., to furnish the same. of which about 640 hp will be required.

THOMASVILLE, N. C.—Announcement has been made that the controlling interest in the Thomasville Light & Power Company has been purchased by Frank H. Fleer, of Philadelphia, Pa., and B. F. W. Bryant, general manager of the company. Mr. Fleer has been elected president; J. C. Bryant, secretary and treasurer, and F. W. Bryant will continue to hold the position of general manager. It is expected that the new management will extend and improve the service.

WHITEVILLE, N. C.—A franchise has been granted to the Whiteville Light & Power Company to construct and operate an electric light plant in Whiteville. J. R. Williamson and others are interested in the enterprise.

WILLISTON, N. D.—The Council is considering the question of calling an election to vote on the proposition to issue bonds for an addition to the municipal electric light plant.

CLEVELAND, OHIO.—Finding it impossible to proceed with a plan to have the city and county unite in the construction of a joint power house, the County Commissioners have directed their engineers to proceed with plans for a $250,000 power, lighting and heating plant to be located on West Tenth Street. The sum will be equally divided between building and equipment. A $100,000 tunnel has been eliminated from the plan. It is said that a bill will be introduced giving the Commission power to make a long term contract with a company for light, heat and power for the court house. If it is found that the service can be purchased on a long term contract cheaper than the county can operate its own plant, a contract will be made. A temporary plant is being used at the present time.

COLUMBUS, OHIO.—Bids will be received by the Board of Managers of the Ohio Penitentiary until Feb. 11 for equipment for power plant for Ohio Penitentiary as follows: Two direct-connected exciter units, consisting of 75-hp simple horizontal, automatic high-speed engines, and 50-kw, 125-volt, direct-current generators, plans and specifications for which are one file at the offices of Marriott & Allen, 20 East Broad Street, Columbus, Ohio; the Osborn Engineering Company, Osborn Building, Cleveland, Ohio, and the office of the warden of the penitentiary, Columbus, Ohio. Bids must be made on blank forms, which will be furnished on application to architects or engineers.

COSHOCTON, OHIO.—W. A. Himebaugh, president and manager of the Coshocton Light & Power Company, writes that the company is now installing a steam turbine and two alternators, which will soon be put in operation. The company has acquired a water power at the outskirts of the city capable of developing about 1500 hp. The hydroelectric power plant will be built this summer, and electricity generated at this plant will be distributed through the present distribution system of the company.

HAMILTON, OHIO.—Plans are being considered for changing the lighting system of the municipal electric-light plant from single-phase over to three-phase, and also for several miles of line extension for both street and incandescent lighting. The corporate limits of the city have been extended, and a bond issue of $25,000 has been made to provide for extension of lines for lighting the same. During the past year the plant has turned over to the bond fund the sum of $20,000. James O'Toole is superintendent.

LODI, OHIO.—C. L. V. Williams, owner of the local electric light plant, is contemplating the installation of another 60-hp boiler in the near future and establishing a day service.

MARIETTA, OHIO.—The electric-light plant owned by George Walker was destroyed by fire Jan. 6, causing a loss of about $10,000.

MINSTER, OHIO.—Plans are being considered for the installation of another gas-engine unit with a rating of 35 kw. It is also proposed to establish a 24-hour service for lamps and motors.

OTTAWA, OHIO.—The Electric Light Company has changed its system from single-phase to three-phase, 60 cycles. A day service has also been established.

WARREN, OHIO.—The Warren Water & Light Company is making extensive improvements and additions to its plant, which will include the installation of a 450-hp Sterling boiler, one 200-kw and one 400-kw alternators and one 500-kw steam turbine with complete new switchboard, all of which are being furnished by the General Electric Company, Schenectady, N. Y. The system is being changed from 133 cycles to 60 cycles, three-phase. A new condenser made by the Fort Wayne Manufacturing Company is also being installed. It is expected to have the new machinery in operation some time in March. C. E. Inman is superintendent.

WAVERLY, OHIO.—The contract for reconstructing the pole lines in connection with the municipal electric light system has been awarded at $4,990. The citizens have recently voted to issue $35,000 in bonds, the proceeds to be used for construction of a water-works system in connection with the municipal electric light plant. Joseph W. Overman is superintendent.

ALTUS, OKLA.—It is reported that an election will be called to vote on the proposition to issue $200,000 in bonds, the proceeds to be used for electric light, water works and sewer systems.

ARDMORE, OKLA.—Plans are being prepared by the Arbuckle & Western Railroad Company for the construction of an electric power plant in Ardmore.

ARDMORE, OKLA.—The J. W. Maxey Engineering Company, of Houston, Tex., has been engaged by the Board of City Commissioners to prepare an estimate of the construction of a hydroelectric power plant on the Washita River. Bonds will be voted to secure funds for construction of the plant.

OKLAHOMA CITY, OKLA.—Preparations are being made by Morris & Company to operate its packing plant in Oklahoma City, Okla., entirely by electricity. Orders have recently been placed with the Allis-Chalmers Company, Milwaukee, Wis., for the following equipment: One 250-kw, 480-volt, two-phase, 60-cycle, revolving field generator direct-connected to a 16 x 32 x 36 cross-compound, condensing engine operating at 100 r.p.m., and one 350-kw generator of the same type as above, direct-connected to an 18 x 36 x 42 cross-compound condensing engine. Both generators are provided with 22-kw direct-current exciters belt driven from main units. A ten-panel switchboard is supplied for controlling the lines. Induction motors (35 in number) varying in size from 5 to 60 hp will be installed for driving the various machines and conveyors.

DRAIN, ORE.—Application has been made to the City Council by the Drain Light & Power Company for a franchise to furnish electricity for lamps in Drain.

ROSEBURG, ORE.—Improvements are contemplated by the Pacific Telephone & Telegraph Company to its local service during the coming year which will involve an expenditure of about $47,000.

CHAMBERSBURG, PA.—Orders have been placed with the Fort Wayne Electric Works, Ft. Wayne, Ind., for equipment for the municipal electric light plant as follows: One 500-kw Curtis turbo-generator set, one 300-kw belted alternator, one steam-driven 22½-kw exciter, one motor-driven 22½-kw exciter, nine-panel switchboard and necessary condensing apparatus. J. H. Mourey is superintendent.

FRACKVILLE, PA.—The Union Saw Company, of Williamsport, Pa., is planning to erect a new plant in Frackville. The power plant will occupy a separate building, 73 ft. x 77 ft., the equipment of which will include a 300-hp direct-connected unit, consisting of engine and generator. It is expected to have the plant ready for occupancy in March.

OXFORD, PA.—The Continental Telephone Company, the new company which has taken over the control of the independent telephone lines in this county, is making arrangements to make extensive improvements to the telephone lines in the vicinity of Oxford.

PITTSBURGH, PA.—Plans are being considered by the Pittsburgh Coal Company, of Pittsburgh, Pa., for the installation at its properties of alternating-current generators, each driven by a 200-hp Corliss engine. Considerable other equipment for handling coal will be required by the company during the next few months.

PITTSBURGH, PA.—It is reported that the McKinney Manufacturing Company, North Side, Pittsburgh, Pa., has decided to abandon its own power plant and has entered into a contract with the Allegheny County Light Company for electrical energy for a long term of years. The company will use about 560 hp, replacing its own plant with a synchronous motor-generator set. Orders for electrical machinery have been placed with the General Electric Company, of Schenectady, N. Y.

RINGTOWN, PA.—We are informed that the Ringtown Light, Heat & Power Company is contemplating enlarging its plant in the near future. J. A. Yost is secretary.

ST. MARYS, PA.—The St. Marys Electric Company has recently installed two 250-kw, 2200-volt, 60-cycle Ridgway dynamos complete with exciters; also a new switchboard manufactured by Westinghouse Electric & Manufacturing Company. The company proposes to establish a day service at once. F. H. Murray is manager.

SHIPPENSBURG, PA.—C. W. Harman, manager of the Shippensburg Gas & Electric Company, writes that the company expects to establish an alternating-current day service for lamps and motors, single-phase for lamps and three-phase for motors.

SPRING CITY, PA.—The Century Knitting Company is reported to be considering the purchase of boilers, engine and electric generator in the near future.

CHERAW, S. C.—Plans are being considered for increasing the output of the municipal electric light plant by the installation of a 125-kw direct connected unit in the near future. W. E. McLauchlin is superintendent.

COLUMBIA, S. C.—The Glencoe Cotton Mills Company has been organized to erect a cotton mill to be equipped with about 5000 spindles. The plant will be operated by electricity, of which about 175 kw will be required. T. H. Wanamaker, of Orangeburg, S. C., is president, and G. M. Berry, of Columbia, S. C., vice-president.

PARKSTON, S. D.—Preparations are being made by the Sioux City, Sioux Falls & Missouri River Railway Company to commence work on its proposed railway about March 10. According to the present plans the railway will extend from Sioux City, S. D., to Sioux Falls, Ia., thence to Yankton, S. D., a distance of 170 miles. Application for a franchise has been made in Sioux City. The company is capitalized at $1,500,000. C. A. Magee, of Parkston, S. D., is president and purchasing agent, and M. J. Walker, secretary and treasurer.

SIOUX FALLS, S. D.—John Morrell & Company, of Sioux Falls, S. D., contemplate the installation of a large power and refrigerating plant.

APALACHIA, TENN.—Preparations are being made by the Carolina-Tennessee Power Company for the construction of two dams, each 250 ft. in height, to develop 60,000 hp for electrical transmission. One dam will be located at Apalachia and the other 13 miles up the river. The contract for construction of dam and installation of electrical machinery has been awarded to the Ambursen Hydraulic Construction Company, 176 Federal Street, Boston, Mass. It is said that the plant will furnish electricity to operate two large copper mines in Ducktown, Tenn. Electrical energy will be supplied to towns as far south as Rome, Ga., and north as far as Etowah, Tenn. William L. Church, president of the construction company, is consulting engineer. Executive office of the Carolina-Tennessee Company is located at 115 Broadway, New York, N. Y.

BINGHAMTON, TENN.—Preparations are being made by the Binghamton Light & Power Company to double the output of its plant within the next 60 days. W. M. Tucker is manager.

NASHVILLE, TENN.—The Fisk University, it is reported, contemplates the installation of a central heating and lighting plant. George A. Gates is president.

BROWNSVILLE, TEX.—The plant and holdings of the Brownsville Telephone Company have been purchased by C. E. Wells, of Kingsville, Tex.

CROCKETT, TEX.—The plant and holdings of the Citizens' Ice & Light Company have been purchased by C. L. Edmiston. It is said that the new owner will make improvements to the plant, which will involve an expenditure of about $7,000.

GREENVILLE, TEX.—Mayor Frank Nichols is reported to be interested in a project to organize a company for the construction of an electric railway from Greenville to Wolfe City. It is also planned to build extensions from Greenville to Plano and from Wolfe City to Clarksville.

HOUSTON, TEX.—Preparations are being made for the complete rearrangement of the present street lighting system. The arc lamps now suspended across the streets will be placed on the sidewalks. The work will be done under the supervision of Clarence George Wilson, city electrician.

PITTSBURG, TEX.—The Arkansas & Texas Consolidated Ice & Coal Company is contemplating the installation of a gas engine and producer plant of about 75 hp. W. H. Brown is manager.

SAN ANTONIO, TEX.—Orders have been placed by the Pioneer Flour Mills Company with the Allis-Chalmers Company, Milwaukee, Wis., for a 16 x 32 x 36 tandem-compound condensing engine with transmission machinery.

SAN BENITO, TEX.—Arrangements are being made by the San Benito Land & Water Company for the installation of an electric light and power plant to furnish electricity for lamps and to operate the pumping station. The plant will be operated by water power. Plans are being prepared by H. H. Sutton, of the Stone & Webster Engineering Corporation, Boston, Mass.

SEYMOUR, TEX.—It is reported that Seymour and Beaumont capitalists have secured the plant and holdings of the Seymour Mill Elevator & Light Company. It is understood that the new owners will improve the electric-light plant and extend the service.

SALINA, UTAH.—A company has been formed in Salt Lake City to take over the electric department of the Salina Roller Mill & Electric Light Company. It is proposed to move the present plant from the mouth of the Salina Canyon to what is known as Rattlesnake Hill, where the company has secured an option on a site, and build a plant with sufficient output to supply electricity to the towns adjacent to Salina, as far north as Gunnison and south as far as Sigurd. As yet plans have not been definitely decided upon.

SALT LAKE CITY, UTAH.—Mayor John S. Bransford in his annual message to the City Council urges improvement in the street lighting system and recommends the establishment of a municipal electric light plant. The city owns a water power privilege which might be utilized to furnish power to operate a municipal plant.

BENNINGTON, VT.—The Twin State Gas & Electric Company is installing an electric plant at the Holden Leonard Company's mill. A 150-kw generator is being installed to furnish electricity to operate the looms installed in the addition recently erected, which will be operated by individual motors.

VERNON, VT.—It is reported that plans are being prepared for the installation of three additional units in the power station of the Connecticut River Power Company in Vernon, Vt., increasing the output of the plant from 15,000 hp to 24,000 hp. The cost of the work is estimated at $150,000, and it will require about six months to complete.

CASTLE ROCK, WASH.—The Pacific Telephone & Telegraph Company has been granted a franchise to construct and operate its system in Castle Rock.

FORT CASEY, WASH.—It is reported that a complete electric lighting system will be installed at Fort Casey, which will involve an expenditure of about $30,000.

SNOHOMISH, WASH.—The plant and holdings of the Snohomish Electric Light & Power Company, which were held by purchase lease by J. E. Welkstrom, of Seattle, Wash., have been taken over by A. D. Kimball, of Seattle. It is understood that a number of Seattle capitalists are associated with Mr. Kimball, who, it is said, is promoting an electric railway from Seattle, via Bothell and Snohomish to Everett. James Burton, of Everett, Wash., has been appointed manager of the company.

SPOKANE, WASH.—The special committee of the Chamber of Commerce has recommended that 600 five-lamp electroliers be installed on the business streets of the city. It is said that property holders will be asked to petition the City Council to have the electroliers erected.

CHIPPEWA FALLS, WIS.—Plans are being prepared by the Chippewa Falls Shoe Manufacturing Company for the construction of a new factory. Equipment required will include power machinery, blowers and sprinkling system. Electric motor-driven machinery is said to be under consideration.

CLINTONVILLE, WIS.—The question of making extensions and improvements to the municipal electric-light plant is under consideration. They will include the installation of a district steam or hot-water heating system; also purchasing power to operate the plant, or purchasing a water power and developing same, or making improvements to the present plant to increase the output. John Kuester is superintendent.

DE PERE, WIS.—Arrangements are being made by the De Pere Electric Light & Power Company to equip its plant to take electricity from the plant of the Green Bay Traction Company's plant, five miles distant. The company is now installing a 150-kw rotary converter, three 100-kw transformers and alternating-current motor circuit. Electricity will be taken at 15,000 volts, three-phase, 25 cycles. L. L. Tessier is superintendent.

MANITOWOC, WIS.—It is reported that Dr. J. F. Pritchard and others are interested in a project to develop the water power of the Manitowoc River.

MANITOWOC, WIS.—Charles F. Schuetze, of Manitowoc, Wis., who is interested in a new woodworking plant, is in the market for equipment for the same, including a boiler of from 125 to 150 hp, Corliss engine, dynamo, motors, blower system, sprinklers and other machinery. For further information address Mr. Schuetze, care of the Manitowoc Church & School Supply Company, Manitowoc, Wis.

MILWAUKEE, WIS.—Plans are being made by the Charles H. Stehling Company, of Milwaukee, Wis., for the construction of a factory building. Motor-driven machinery will be installed.

MILWAUKEE, WIS.—Fred E. Schuler & Brother Company, of Milwaukee, Wis., which is erecting a new factory, will soon purchase power machinery, including motors; also woodworking and forging machines.

PORT WASHINGTON, WIS.—The Milwaukee Northern Railway Company is reported to be considering the installation in its power station in Port Washington during the coming year of an additional gas engine and dynamo with a rating of 1500 hp.

SPARTA, WIS.—O. I. Newton's Sons Company, owner of the local electric-light plant, is contemplating the installation of motor-driven pumps for city and other concerns. The company is now installing Tirrell voltage regulators and station recording watt meters. G. M. Newton is president and manager.

ARMSTRONG, B. C., CAN.—The Shuswap Falls Light & Power Company is negotiating for the purchase of the local electric-light plant. The construction of an electric railway connecting Enderby, Armstrong and Vernon with Grand Prairie and Salmon River is under consideration by the company.

NEW WESTMINSTER, B. C., CAN.—The Conteau Power Company, which is reported to be constructing a monorail railway in the Okanogan Valley, has recently made an application in Victoria for a franchise to build an electric railway.

VANCOUVER, B. C., CAN.—The British Columbia Electric Railway Company has placed an order with the Allis-Chalmers Company, Milwaukee, Wis., for two 2000-kw, 1800 r.p.m., 60-cycle, three-phase, condensing steam turbo-generator units. The new equipment will be used in connection with extension of the service.

VICTORIA, B. C., CAN.—The British Columbia Electric Railway Company has purchased a large site for suburban terminal uses at a cost of $750,000. Announcement has been made by the company of its intention to extend its electric railway lines through districts tributary to Victoria, which, with the construction of its new power plant on the Jordan River, will involve an expenditure of about $3,000,000. It is expected to complete the power plant by Sept. 1.

BRANDON, MAN., CAN.—Application has been made to the City Council by E. J. Gifford for a street railway franchise in Brandon.

CHATHAM, ONT., CAN.—We are informed that preparations are being made by the Chatham Gas Company to furnish electricity to operate the system of the Chatham, Wallaceburg & Lake Erie Railway Company. The gas company will install a 250-kw motor-generator set, to be used in connection with a 275-kw alternator. P. S. Coate is secretary and manager.

TORONTO, ONT., CAN.—Preparations are being made by the Grand Trunk Railway Company to install a telephone system on a portion of the Northern division, which will be used as an auxiliary to the present telegraph service.

WINCHESTER, ONT., CAN.—The present street lamps are being replaced with 60-watt tungsten lamps. Thomas O. Van Bridger is manager of the local electric plant.

MONTREAL, QUE., CAN.—The City Council has appointed a committee to confer with the Montreal Street Railway Company to extend its system to the west end of the city. When previous negotiations were carried on the company demanded a 50-year franchise in return for the construction of the extension required by the municipality, which was refused.

MOOSE JAW, SASK., CAN.—P. M. Lauder, of Ottawa, civil engineer of the Department of the Inteior, has been making investigations into the feasibility of a water power on Moose Jaw River to supply power for Moose Jaw.

DAWSON, YUKON DIST., CAN.—It is reported that preparations are being made for the construction of a power ditch near the north fork of the Klondike River in the spring. The water is to be carried eight miles to a point on the main river, where it will have a fall of 30 ft., and will be utilized to generate electricity, which will be transmitted to points along the Hunker or over the divide. A. N. C. Treagold is interested in the enterprise.

AGUASCALIENTES, MEX.—The Cia Electrica de Aguascalientes is contemplating the purchase of a 3000-volt, three-phase, 60-cycle generator and a 230-hp, 1890-r.p.m. Koerting gas engine, with necessary switchboard apparatus. The company also expects to award contract for the construction of about 1¼ miles of track in the near future. Leon Branger is general manager.

CHIHUAHUA, MEX.—Quayley Brothers are reported to be making arrangements to install hydroelectric power at the Yoquivo Mine. R. V. Nealy is manager of the camp.

New Industrial Companies.

THE ALLEN MURPHY COMPANY, of Chicago, Ill., has been incorporated with a capital stock of $10,000 by Emmett L. Murphy, Louis S. Allen and Paul P. Harris, all of Chicago, Ill., for the purpose of manufacturing machinery.

THE AMERICAN GUARANTEE COMPANY, of Charlotte, N. C., has been organized by J. W. Conway, W. H. Wood, John M. Scott, and others. The company is capitalized at $50,000 and proposes to finance fire-protection equipment, electrical motive power and other mechanical installation. The main purpose of the company is to encourage the use of electricity in cotton mills and other manufacturing plants. It is said that J. W. Conway will be president.

THE ATHENS ENGINEERING COMPANY, of Athens, Ga., has been chartered with a capital stock of $7,000 by C. M. Roberts and Joel A. Weir. The company proposes to engage in an electrical contracting business, etc.

THE BORDENTOWN FORGE & MACHINE COMPANY, of Fieldsboro, N. J., has been granted a charter with a capital stock of $50,000 for the purpose of doing a general mechanical and electrical engineering and machinist business. The incorporators are: P. L. Swank, of Bordentown, N. J.; A. H. Burton and R. B. Seyfert, of Philadelphia, Pa.

CHRISTIAN J. JEPPERSEN, INC., of New York, N. Y., has been chartered with a capital stock of $4,000 to do a general civil engineering business. The incorporators are: Christian J. Jeppersen, Charles Morgenroth, and Albert A. Meeker, all of New York, N. Y.

THE CONTINENTAL STOKER COMPANY, of Chicago, Ill., has filed articles of incorporation with a capital stock of $25,000 for the purpose of manufacturing machinery, engines and boilers. The incorporators are: C. Pekat, W. Pekat, and H. Pekat, all of Chicago, Ill.

THE ENGINEERING & EQUIPMENT COMPANY, of Wheeling, W. Va., has been chartered with a capital stock of $5,000 by H. S. Sands, H. R. Stuart, E. O. Kiger, and others. The company proposes to manufacture dynamos, motors, telephone and telegraph apparatus.

NELSON GOODYEAR, INC., of Millbrook, N. Y., has filed articles of incorporation with a capital stock of $500,000 for the purpose of dealing in electric and acetylene apparatus, rent electric and acetylene buoys, etc. The incorporators are: E. Van Zandt, H. Binney, and S. C. Mastick, of New York, N. Y.

THE GEORGE E. MOLLESON COMPANY, of New York, N. Y., has been chartered with a capital stock of $30,000 for the purpose of dealing in iron, steel and railway supplies. The incorporators are: G. E. Molleson, L. F. Doyle, and C. H. Payne, of New York, N. Y.

THE JOHN P. MULLER MANUFACTURING COMPANY, of New Rochelle, N. Y., has filed articles of incorporation with a capital stock of $25,000 for the purpose of manufacturing all kinds of burning instruments, including surgical, mechanical and electrical. The incorporators are: J. P. Muller, W. Jacobson, and M. Muller, of New Rochelle, N. Y.

THE NATIONAL GAS TURBINES COMPANY has filed articles of incorporation with the Secretary of State with a capital stock of $250,000. The incorporators are: W. G. Griffin, W. D. Dupont, and E. E. Griffin, of Washington, D. C.

THE NATIONAL SUPPLY & EQUIPMENT COMPANY, of Chicago, Ill., has been incorporated with a capital stock of $50,000 by H. C. Rumery, of Chicago, Ill. The company proposes to manufacture and deal in railway supplies and equipment.

THE NATIONAL X-RAY TUBE COMPANY, of Chicago, Ill., has been chartered with a capital stock of $2,500 by Gustav Hainz, Lyman H. Coleman, and C. A. Coleman, all of Chicago, Ill. The company proposes to manufacture scientific apparatus.

THE NILMELIOR ELECTRICAL COMPANY, of New York, N. Y., has been incorporated with a capital stock of $150,000 by G. Pouzet, O. V. Screnk, and F. F. Kirkpatrick, of New York, N. Y. The company proposes to deal in electrical apparatus and supplies.

THE J. B. REID ENGINEERING & CONTRACTING COMPANY, of Jersey City, N. J., has been incorporated with a capital stock of $100,000 by H. M. Browne, R. Meyer, and I. Frankel, of New York, N. Y. The company proposes to do a general engineering and contracting business.

THE REPUBLIC ENGINEERING & CONSTRUCTION COMPANY, of Buffalo, N. Y., has been incorporated with a capital stock of $25,000 by F. G. Lane, W. T. Lane, of Buffalo, N. Y., and E. J. Prouix, of Philadelphia, Pa. The company proposes to do a general contracting business; also build and repair heating, ventilation and power systems.

THE SOUTHEASTERN ENGINEERING COMPANY, of Birmingham, Ala., has been incorporated with a capital stock of $7,500 for the purpose of doing a general contracting business. The officers are: J. H. Scruggs, president; E. T. Morrison, vice-president, and Thomas Stobert, secretary and treasurer.

THE F. STORSBERG COMPANY, of Newark, N. J., has been incorporated with a capital stock of $100,000 by F. Strosberg, E. B. Morrison, of Newark, N. J., and J. F. Blackman, of Red Bank, N. J. The company proposes to manufacture gas and electric light fixtures and artistic brass goods.

THE TAXIMETER CONTROL COMPANY, of New York, N. Y., has been chartered by J. D. Sulsona, H. B. Goodstein, O. M. Arkenburgh, all of New York, N. Y. The company is capitalized at $100,000 and proposes to deal in machinery, engines, motors, etc.

THE TOLEDO ELECTRIC WELDER COMPANY, of Cincinnati, Ohio, has been incorporated with a capital stock of $75,000 by C. B. Dewitt, M. H. Heatley, C. V. Baumgardner, S. B. Ransom and A. J. Scheuler, all of Cincinnati, Ohio. The company proposes to erect a plant in Cincinnati to manufacture electric welding and generating machinery.

THE UNIVERSAL VACUUM MAIL TUBES COMPANY, of Chicago, Ill., has been chartered with a capital stock of $100,000 for the purpose of manufacturing vacuum mailing tubes. The incorporators are: C. L. Backus, J. Schmitt, C. Schleyer, and H. P. Simonton, of Chicago, Ill.

THE WHIPPLE-STRUB ELECTRIC COMPANY, of Toledo, Ohio, has been chartered by Charles W. Whipple, Jacob W. Strub, William R. Dohm, W. S. T. O'Hara, and C. E. Kachenmeister. The company is capitalized at $10,000 and will do a general electric business and take over the plant of DeFrance & Strub, located at Monroe and Michigan Streets. Jacob W. Strub will be president of the company.

New Incorporations.

OIL THROUGH, ARK.—The Oil Through Telephone Company has been incorporated, with V. Y. Cook, president; Paul Butler, vice-president; M. Morrow, secretary, and V. Cook, treasurer.

CHICO, CAL.—Articles of incorporation have been filed for the Deer Creek Power Company by C. C. Royce, W. J. O'Connor, A. G. Eames, T. H. Barnard, B. Cusick, Thomas N. Crew and Park Henshaw. The company is capitalized at $100,000.

DENVER, COL.—The Home Power & Irrigation Company has been incorporated with a capital stock of $1,500,000 by J. R. Leech, of Littleton, Col.; Hayward D. Warner and A. B. Sanford, of Denver. The company proposes to construct a large power plant on Bear River above Morrison to furnish electricity for all purposes in Denver and surrounding territory. The project includes the construction of a reservoir with a capacity of 40,000 acre-ft. of water, created by a dam 96 ft. high. The main canal will be 12 miles long, and there will be 60 miles of laterals. The system will furnish water to irrigate about 25,000 acres of land lying about 35 miles south of Lamar.

DOVER, DEL.—Articles of incorporation have been filed for the Northern States' Power Company, of Chicago, with the Secretary of State with a capital stock of $10,000,000 by E. J. Graf, Mathew A. Morrison, Garrison Growvig and F. W. Sterns, all of Chicago, Ill., and Warren W. Aiken, of Wilmington, Del.

WILMINGTON, DEL.—The Atlantic City Company has filed articles of incorporation with the Secretary of State with a capital stock of $6,000,000 for the purpose of generating and distributing gas and electricity.

ARCO, IDAHO.—The Arco Telephone Company has been chartered with a capital stock of $1,500. The officers are: John W. Fowler, president and manager; Otto B. Fisher, vice-president, and W. Sweet, secretary and treasurer.

INDIANAPOLIS, IND.—The Beech Grove Traction Company has been incorporated with a capital stock of $10,000 for the purpose of constructing an electric railway from Indianapolis to Beech Grove. The company also proposes to operate power plants. The directors are W. H. Ogan, M. T. Hawkins and S. E. Hamlin.

AUGUSTA, ME.—The United Service Company has been incorporated with a capital stock of $125,000 to operate telegraph and telephone lines. The officers of the company are: R. S. Buzzle president, and E. J. Pike, treasurer, both of Augusta, Me.

SALISBURY, N. C.—A charter has been granted to the Virginia Power Company, which has a capital stock of $50,000, for the purpose of development of water-power, to be utilized to generate electricity for transmission for commercial purposes. The incorporators are: John J. Mott, N. B. McCanless, J. D. Norwood and others.

SHOPTON (P. O. CHARLOTTE), N. C.—The Steel Creek Telephone Company has filed articles of incorporation with a capital stock of $5,000.

ROLETTE, N. D.—The Ox Creek Farmers Telephone Company has been incorporated for the purpose of constructnig a telephone line south of Rolette. Hans L. Amore is secretary.

HOLLSOPPLE, PA.—A charter has been granted to the White Oak Light, Heat & Power Company with a capital stock of $20,000. The incorporators are: Joseph Caufiel, of Johnstown, Pa.; C. C. Zimmerman, Emanual Eash, Hiram W. Lint, Mahlon Keim, Aaron Miller and William Baer, all of Hollsopple; Daniel Yoder, H. J. Spaugy, Charles Naugle and Joseph Naugle, of Hooversville.

NASHVILLE, TENN.—Articles of incorporation have been filed for the Markwood Power Developing Company with a capital stock of $20,000 by A. T. Markwood, C. E. Burchfield, A. A. Taylor, W. H. Martin and S. C. Williams.

ROYALTON, VT.—The Royalton Power Company has been incorporated with a capital stock of $16,000 by Frederick L. Walker, N. Curtis Fletcher and Robert B. Keltie, Jr., of Boston, Mass.; Marvin H. Hazen, of South Royalton, and Arthur N. Stoughton, of Royalton. The company proposes to supply electricity for lamps and motors in the towns of Royalton and Windsor and other places in Orange and Windsor counties.

RICHMOND, VA.—The Atlantic Ice & Coal Company has been incorporated with a capital stock of $8,000. The company proposes to establish ice and cold-storage, electric-light and power plants and to mine coal. The officers are: Ernest Woodruff, president; W. J. Rushton and W. E. Chapin, vice-presidents, and J. C. Gentry, secretary and treasurer, all of Atlanta, Ga.

WINNECONNE, WIS.—The Winneconne Heat, Light & Power Company has been incorporated with a capital stock of $10,000 by Mathis Mathison, Martin Mathison and Grace E. Mathison.

HOQUIAM, WASH.—Articles of incorporation have been filed for the Grays Harbor Interurban Company by R. F. Lytle, A. L. Paine and O. E. McGlauflin, all of Hoquiam; W. H. Abel and Eldredge Wheeler, of Montesano; A. M. Abel and P. S. Locke, of Aberdeen. The company is capitalized at $500,000 and proposes to build an electric railway from Hoquiam to Tacoma, via Olympia.

ST, MARY'S, W. VA.—The Citizens' Telephone Company has been incorporated with a capital stock of $10,000 by J. Riley McCullom, O. C. Ogden, D. E. Dye and others.

MISSION, B. C., CAN.—The Mission Water, Light & Power Company has been incorporated with a capital stock of $50,000 to take over the water rights and holdings of H. Windebank, and to supply the city with water, etc.

Personal.

MR. J. W. LIEB, JR., was elected vice-president of the National Society for the Promotion of Industrial Education at its annual meeting held at Milwaukee, Dec. 2-4, 1909.

MR. H. I. MILLARD, recently with the Westinghouse Company at Pittsburgh, has joined the staff of the Sales Department of the Toronto Electric Light Company, Limited.

MR. F. L. DAME, formerly engineer of the Electrical Securities Corporation, New York City, has been elected vice-president of the Electric Bond & Share Company. Mr. Dame has also been elected vice-president and a director of the American Power & Light Company.

MR. JOSEPH J. O'BRIEN has resigned as general secretary of the Inventors' League, Washington. In tendering his resignation Mr. O'Brien stated that he had failed to receive the earnest and honest co-operation in favor of the reform of existing patent conditions which he had expected.

MR. BERNARD E. SUNNY, president of the Chicago Telephone Company, vice-president of the American Telephone & Telegraph Company and director of the General Electric Company, has been elected a director of the First National Bank, of Chicago, thus adding another to his numerous activities. The First National is the largest bank in Chicago.

MR. GEORGE F. BROCKMAN has resigned as superintendent of the Argenta (Ark.) Electric Light & Power Company in order to become superintendent of construction for an electric light and water-works plant for the city of Ryan, Okla. Upon finishing this work, Mr. Brockman will take up the construction of a similar plant at Wetoka, Okla.

DYER, DYER & TAYLOR.—The practice of patent, trade-mark, copyright and corporation law, etc., heretofore conducted at 31 Nassau Street, New York, in the firm name of Dyer & Dyer will be continued under the firm name of Dyer, Dyer & Taylor, the individual members of the firm remaining the same, namely, Messrs. Richard N. Dyer, Leonard H. Dyer and John Robert Taylor.

MR. HAROLD W. BROWN, for several years in charge of the meter department of the Westinghouse Electric & Manufacturing Company, read a paper entitled "Recent Designs in Electrical Measuring Instruments" at a meeting on Jan. 11 of the Pittsburgh A. I. E. E. Section. Mr. Brown showed lantern slides illustrating the most recent designs of both European and American indicating, integrating and recording meters, including instruments using electricity for measuring other quantities.

MR. HJALMAR HERTZ, until recently assistant chief engineer of the Western Electric Company at the Hawthorne Works, Chicago, has resigned to accept the position of advisory engineer for the General Electric Company, with headquarters at Lynn. Mr. Hertz is a graduate of the University of Zurich, Switzerland, and an associate member of the American Institute of Electrical Engineers. He was the recipient of several dinners and farewell entertainments before his departure from Chicago last week.

MR. BERNARD CORRIGAN has resigned as president of the Kansas City Railway & Light Company, Kansas City, Mo. Mr. Corrigan was appointed to the position of president of the company in 1902, following the retirement of Mr. W. H. Holmes as president of the Metropolitan Street Railway and Mr. C. F. Holmes as president of the Kansas City Electric Light Company and the organization of the Kansas City Railway & Light Company to succeed these companies. Mr. Corrigan is a civil engineer by profession and is about 50 years old. Up to about 1892 he was closely identified with street railway interests in Kansas City and was familiar with the railway and lighting properties in the city when elected president of the Kansas City Railway & Light Company. In announcing his retirement, Mr. Corrigan stated that he had for some time desired to relinquish his duties and tried to induce Mr. C. N. Black, now vice-president and general manager of the United Railroads of San Francisco, to remain with the company as his successor.

MR. SAMUEL G. NEILER, of the engineering firm of Pierce, Richardson & Neiler, Chicago, has been interviewed in London in relation to electric railway and electrical engineering subjects. In relation to subways Mr. Neiler is rather skeptical as to the value of this method of transportation. He is quoted as saying that "the whole underground business in London seems to be a failure. The people refuse to go below and prefer to ride in omnibuses, taxicabs and surface electric cars. It is doubtful if this preference ever can be overcome." The situation in Paris is better, for the lines are well managed and the service is regular and quick. Here stops at stations average only 11 seconds, whereas in London they are probably three or four times as long. The London underground roads seem to offer few ideas likely to be useful in America. Mr. Neiler looked about on the Continent to see if he could get any ideas of value in relation to the electrical engineering of the Chicago & Northwestern railroad terminal in Chicago, but he is reported to have said that he was unable to discover much worth copying in the methods of handling railroad passengers in Europe.

Obituary.

MR. H. J. BUDDY died Jan. 15 after suffering only a few days from pleuro-pneumonia. Mr. Buddy had for 18 years been manager of the lighting, power and mining departments of the Philadelphia district of the General Electric Company, and was identified with the electrical business since 1885, when he became associated with the Thomson-Houston Electric Light Company, of Pennsylvania. He was born in Philadelphia 44 years ago, and always made that city his home. He was a member of the Merion Cricket Club, Haverford, the Art Club, Philadelphia, the National Electric Light Association, and associate member of the American Institute of Electrical Engineers. Mr. Buddy was a widower at the time of his death, and is survived by his father, a sister, and a brother. His loss will be keenly felt by a host of friends, especially in electrical circles throughout the country, to whom he was endeared by a genial disposition and a character that invited esteem.

MR. WILLIAM J. BAXTER.—We regret to announce the death of Mr. William J. Baxter, which occurred at his home in Jersey City, N. J., Jan. 12. Mr. Baxter did much important work in the pioneer days of electric lighting. In the early eighties he invented the enclosed arc lamp, but owing to the impossibility of obtaining glass globes that would withstand the great heat, the lamp was abandoned after some practical trials. He next turned his attention to the electric motor, and produced a motor for use on arc light circuits which went into extensive use. This motor was exhibited at a meeting of the National Electric Light Association in 1887, and large numbers were sold during the next four or five years, or until the constant potential motor took final possession of the field. In 1886 the Baxter Electric Mfg. & Motor Company was formed and works built in Baltimore, which, after being enlarged in 1888, were said to be one of the largest electrical manufacturing works in the world. The speed of the series current motor was regulated by cutting out a section of the field coil by the action of a centrifugal governor on the motor shaft. In another form there were three brushes, one of which was a regulating brush moved also by a centrifugal governor. The Baxter motor was made in sizes from 1/10 hp to 20 hp, the smaller size being used to run sewing machines in the manufacture of collars. The Baxter works also manufactured generators, and in 1889 brought out a Baxter street car motor, and in 1891 a Baxter railway generator. Mr. Baxter contributed very largely to the technical press, and was the author of a number of electrical books. In recent years he confined his attention to literary work and to giving testimony as an expert in electrical litigation.

MR. J. T. MARSHALL.—The many friends of Mr. John T. Marshall, assistant engineer of the lamp works of the General Electric Company at Harrison, N. J., will regret to learn of his death on Jan. 1 at Bermuda, to which place he had gone in search of health. Mr. Marshall was born at Kingston, N. Y., in the year 1859. He was graduated from the scientific department of Rutgers College in 1881 with the degree of B. S. In October of the same year he entered the employ of the Edison Lamp Company, and, with the exception of two years spent in the laboratory of Mr. Thomas A. Edison, continued his connection with the same interests up to the time of his death. Much of Mr. Marshall's work while with Edison, the Edison Lamp Company and the General Electric Company was devoted to experimental investigation of incandescent lamp filaments. Among his contributions to engineering literature were a paper entitled "Some Methods of Photometry as Applied to Incandescent Lamps," which was presented before the American Institute of Electrical Engineers in 1902, and a written discussion on the "Relation between Candle-power and Voltage of Different Types of Incandescent Lamps" in the *Transactions* of the Illuminating Engineering Society, 1908. Mr. Marshall was a member of the American Institute of Electrical Engineers and of the Illuminating Engineering Society. He invented and perfected the comparison method of photometering incandescent lamps, which is the method by which practically all commercial photometric measurements are made on incandescent lamps in lamp factories. This method requires no voltmeter or ammeter, but reads volts and amperes. Mr. Marshall was universally loved and respected. He was the president and leading spirit in the G. E. Outing Club and made its semi-annual outings the signal success which they were. He was married, and had always lived in Metuchen, N. J.

MR. J. T. MARSHALL.

Trade Publications.

ARC LAMP INSULATOR.—The Western Electric Company has issued an illustrated folder descriptive of the "Electron" arc lamp insulator.

LIGHTING FIXTURES for all purposes are listed and described in illustrated bulletin No. 115 issued by the Federal Electric Company, Chicago, Ill.

ELECTRIC RADIATORS are illustrated, listed and briefly described in publication No. 604 of Veritys, Ltd., 31 King Street, Covent Garden, W. C., London, England.

SUCTION SWEEPER.—The Hoover electric suction sweeper is well outlined on a neat calendar card being distributed by the Electric Suction Sweeper Company, New Berlin, Ohio.

IRON CONDUIT.—The National Metal Molding Company, Pittsburg, Pa., is distributing postcards showing the new West Boston bridge, where "Sheraduct" conduit has been installed.

MOTOR CONTROLLERS for squirrel-cage induction type machines are well shown in supply catalogues Nos. 57, 58 and 59 of the British Westinghouse Electric & Manufacturing Company, Ltd., Manchester, England.

OZONE.—An interesting booklet dealing with disease-breeding germs in water and their destruction with ozone produced by electricity has been issued by the United Water Improvement Company, Philadelphia, Pa.

MAGNETO TELEPHONE SWITCHBOARDS.—Bulletin No. 1001 of the Western Electric Company, Chicago, Ill., gives a well-prepared discussion of magneto non-multiple telephone switchboards with self-restoring line signals.

ELECTRICAL INSTALLATIONS suitable for bungalows, plantations and country homes are illustrated, listed and described in publication No. X 108 of Veritys, Ltd., 28 King St., Covent Garden, W. C., London, England.

CONCRETE REINFORCEMENT.—Much interesting information relating to the reinforcement of concrete is contained in an artistic booklet issued by the Brown Hoisting Machinery Company, dealing with its product known as "Ferroinclave."

CONVEYING MACHINERY.—The Jeffrey Manufacturing Company, Columbus, Ohio, has issued a 368-page publication, designated as general chain catalogue No. 81, which covers fully elevating, conveying and energy-transmitting machinery of the chain type.

INTERCOMMUNICATING TELEPHONE SYSTEMS are described in an instructive manner in bulletin No. 1105 of the Western Electric Company, Chicago, Ill., which gives much information concerning the selection installation and wiring of such systems.

CALENDAR.—One of the most attractive calendars sent out this season is that of the Di-Electric Company of America, Belleville, N. J. It is a reproduction of an oil painting entitled, "Where the Fox Ran," showing a number of red-coated huntsmen discussing the day's chase.

REFLECTORS.—The Phoenix Glass Company, 15 Murray Street, New York, has issued a neat booklet in which are illustrated, listed and described, reflectors especially designed for use with tungsten lamps. A useful table is given for finding the number of lamps to use in illuminating any room of known dimensions.

LIGHTING FIXTURES.—A well-illustrated loose-leaf catalog relating to lighting fixtures has been issued by the Dale Company, Ninth Avenue and Hudson Street, New York. A complete price-list is also included. The catalog is so arranged that new sheets relating to new designs can be inserted as they are issued, so that the catalog may remain up to date at all times.

STORAGE-BATTERY INSTRUCTION BOOK.—The Electric Storage Battery Company has issued a booklet giving condensed instructions for the operation of "Exide" and "Hycap-Exide" bateries in terms understandable by the ordinary storage-battery user. Only such information is contained as is considered essential and that will aid a user in charging and deriving the proper service from a battery. The booklet is indexed in the margins so that desired information can be referred to with little trouble.

TELEPHONES.—The Western Electric Company, 463 West Street, New York, has issued a neatly-arranged folder describing its No. 100 type rural line magneto telephone and its 5-bar magneto telephone for use where signaling service is employed. A portable composite set is treated in a separate folder, while an additional folder deals with telephones for use in railway terminals. Portable telephones for railway service are briefly described and well illustrated in a booklet recently issued by the company.

THE LIGHTING OF MILLS AND FACTORIES.—The Holophane Company, 227 Fulton St., New York, has issued for free distribution a 32-page booklet presenting the practical problems of mill lighting from the standpoint of both the illuminating engineer and the solicitor for central station service. The booklet is profusely illustrated with photographs of actual installations showing good and bad methods of lighting metal-working machines, looms, warpers, spinners, sewing machines, skiving machines, etc. There are also numerous diagrams showing the proper arrangement of lamps and reflectors for various classes of service.

THE LORD ELECTRIC COMPANY, New York, reports that it has just received a letter from a representative advising that one of the largest foreign municipalities, through its municipality railway engineers, made a test of some 26 styles of catchers and retrievers, and that the engineers' report shows that the Earll came out on top. Two others were all that remained in the service test. The city engineers have therefore issued instructions that all cars in that municipality shall be equipped with the Earll retrievers and catchers. An interesting thing is that these retrievers will be handled by women conductors.

BUSINESS NOTES.

THE WESTERN X-RAY & COIL COMPANY and the W. Scheidel Coil Company have been consolidated under the name of the Scheidel Western X-Ray & Coil Company, with headquarters in Chicago. The capital stock of the new company is $110,000.

PETRY & COMPANY, of Chicago, announce that they have closed their Detroit office and have opened new offices in Philadelphia, Land Title Building, and in Indianapolis, Board of Trade Building. The firm operates electric plants in New Castle and Shelbyville, Ind., and in Three Rivers, Mich.

THE KELLER MANUFACTURING COMPANY, of Philadelphia, has made an arrangement with Charles Strader & Company, 155 Wabash Avenue, Chicago, by which that firm will be its general representative in the West. The Keller company makes the Santo vacuum cleaners and other domestic specialties.

THE RUMSEY ELECTRIC COMPANY, Philadelphia, has moved into its new building at 1231 Arch Street, which was built especially for carrying on the electrical supply business, being occupied exclusively by the firm. As a souvenir of the occasion a handsome aluminum wire gage is being distributed to the trade.

CHICAGO RAWHIDE MANUFACTURING COMPANY'S FACTORY DESTROYED BY FIRE.—The factory of the Chicago Rawhide Manufacturing Company, at 350 West Ohio Street, Chicago, was totally destroyed by fire early on the morning of Jan. 14. The cause of the fire is not known. The company makes rawhide pinions for motors and is well known in the electrical industry. The Ohio Street substation of the Commonwealth Edison Company is near the burned building, but was not injured.

MR. F. V. L. SMITH has opened offices in the Empire Building, Atlanta, Ga., as electrical sales agent for a territory embracing the States of North and South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Oklahoma, Arkansas and Tennessee. Among the manufactures covered are Sterling armored cable and flexible conduit, Shepard electric cranes and hoists, Safety-Armorite Conduit Company's galvaduct and loricated conduit, T. & B. conduit fittings, wireduct, Condit oil circuit-breakers and switches and Clapp-Eastham Company's wireless apparatus. Mr. Smith until recently represented the Sprague Electric Company in the South.

Weekly Record of Electrical Patents

UNITED STATES PATENTS, ISSUED JAN. 11, 1910.

[Conducted by W. F. Bissing, Patent Law, 2 Rector St., N. Y. City.]

945,822. ELECTRICAL APPARATUS FOR MELTING SEALING-WAX; W. T. von Tillow, San Francisco, Cal. App. filed Dec. 14, 1908. For melting sealing-wax by an electric heater located adjacent to a restricted opening in a tube.

945,823. APPARATUS FOR EXHAUSTING INCANDESCENT LAMPS; F. L. O. Wadsworth, Pittsburgh, Pa. App. filed March 17, 1906. A circular table carrying a plurality of devices for holding lamps, for heating and drying the bulbs and for connecting them with an air-exhausting device.

945,856. JUNCTION BOX; T. E. Murray, New York, N. Y. App. filed June 21, 1909. For circuit conductors whereby access to the junctions is prevented by means of a block with grooves for a cover, the cover being sealed.

945,865. METHOD OF CLEANING METAL ARTICLES; J. D. Phillips and C. Hambuechen, Madison, Wis. App. filed Aug. 6, 1909. Immerses the articles in an electrolyte in conjunction with a cleaning metal, such as zinc, and provides electrical contact between the articles and the zinc through an intermediate metal negative to zinc.

945,866. APPARATUS FOR CLEANING METAL ARTICLES; J. D. Phillips and C. Hambuechen, Madison, Wis. App. filed Aug. 6, 1909. (See 945,865).

945,904. STOVE; J. B. Barrett, Niagara Falls, N. Y. App. filed April 14,1909. Steam is the principal heater and electrical resistances are arranged within a box removably mounted within the superheater. The whole constitutes a cooking stove.

945,917. EFFECTING INTERCHANGE OF ELECTRIC CHARGES BETWEEN SOLID CONDUCTORS AND GASES; F. G. Gottrell. Berkeley, Cal. App. filed July 13, 1908. Effects the interchange of electric charges between solid conductors and gases as in the manufacture of ozone, etc., by bringing them into contact with a surface of the conductor consisting of fine filaments.

945,923. DUPLEX TWO-POLE SWITCH; P. Dunning, Schenectady, N. Y. App. filed July 10, 1907. Two switches are pivoted on a common axis, a coilspring closes both of them and either can be opened without operating the other.

945,925. SYSTEM OF POWER DISTRIBUTION; W. L. R. Emmet, Schenectady, N. Y. App. filed April 5, 1909. A power plant for propelling ships by means of a reciprocating engine, a low pressure high speed turbine operated by the exhaust from the engine, a generator driven by the turbine, means for varying the field excitation of the generator, a motor receiving current from the generator which operates with the engine to drive the propeller shaft.

945,926. SMELTING SULPHUR ORES; R. Fleming, Swampscott, Mass. App. filed June 20, 1908. Melts the ore, electrically maintains it in fusion out of contact with the air, forces steam through the ore and cools the vapors.

945,935. WINDOW ALARM; A. D. Girard, Ware, Mass. App. filed Jan. 15, 1909. A bell is sounded when the window is opened. Details.

945,940. RANGE TRANSMITTER; J. L. Hall, Schenectady, N. Y. App. filed Aug. 7, 1908. For permitting the officer on the bridge to give the officer in the turret the range by means of push buttons with catches for locking them when depressed, a shaft carrying the catches with means for locking the shaft. This controls electric circuits.

945,942. ARC LAMP; C. E. Harthan and W. H. Dalton, Lynn, Mass. App. filed Dec. 10, 1904. Constant potential arc lamp with two sets of electrodes in series, the said arc lamp having a movable electrode, a magnet, an armature which moves the movable electrode and an electromagnetic stop actuated by the magnet to arrest the movement of the armature.

945,960. CARBON FEEDING MECHANISM FOR ARC LAMPS; L. O. Kozar, Wilkes-Barre, Pa. App. filed Aug. 9, 1909. The carbon is fed by a pawl and ratchet pulled in one direction by a spring and in the other by a solenoid magnet. Details.

945,964. PASSENGER ELECTRIC RAILWAY CAR; F. H. Lincoln, Philadelphia, Pa. App. filed April 19, 1909. Safety appliances for preventing starting a car when any of the doors remain open by breaking the main car circuit.

945,969. PUSH BUTTON SWITCH RECEPTACLE; N. Marshall, West Newton, Mass. App. filed Sept. 21, 1909. For an electric snap switch consisting of side walls and a bottom wall with ends walls to which a bridge plate is attached and provided with openings for the wire.

945,972. CATENARY SUSPENSION FOR TROLLEY WIRES AND THE LIKE; C. A. Mead. Mansfield, Ohio. App. filed Nov. 14, 1906. The catenary is suspended from two poles by means of insulators and the trolley wire is connected therewith by means of short, connecting rods.

945,990. SYSTEM OF ILLUMINATION; C. P. Steinmetz, Schenectady, N. Y. App. filed June 21, 1907. Has main anodes and a cathode with auxiliary anodes and a metal filament lamp permanently connected in circuit with each auxiliary anode.

945,991. VAPOR ELECTRIC SYSTEM; C. P. Steinmetz, Schenectady, N. Y. App. filed June 21, 1907. A cathode and a plurality of anodes with an auxiliary anode to which energy is supplied at starting and which develops a counter-emf through the starting path after the starting operation is completed.

945,993. RESISTANCE UNIT; E. Thomson, Swampscott, Mass. App. filed Dec. 2. 1904. The resistance material consists of granulated silicon under pressure.

945,995. CONNECTOR FOR ELECTRIC CONDUCTORS; H. G. Weeks, Pittsfield, Mass. App. filed Aug. 3, 1908. A plug and socket connector in which one member has two circuit terminals and the cooperating member three.

945,997. CENTRIFUGAL SWITCH; J. B. Wiard, Lynn, Mass. App. filed Aug. 6, 1908. An alternating-current motor with stationary collector rings, a flexible tension member on the shaft and contacts carried thereby pressed against the rings and thrown away from the rings by centrifugal force when the motor is up to speed.

946,006. PRIMARY BATTERY; T. W. Byrne, Boston, Mass. App. filed Dec. 24, 1908. The container casing is provided with an impervious zinc lining, on the inside of which is a coating of insulating paint of asphaltum.

946,009. PRIMARY BATTERY; T. W. Byrne, Boston, Mass. App. filed Dec. 24, 1908. Zinc carbon battery containing ammonium chlorid. The casing has an impervious lining covered with an insulating paint.

946,027. ADJUSTABLE SUPPORT FOR VAPOR LAMPS; S. E. Flichtner, Englewood, N. J. App. filed Jan. 9, 1905. Frame for vapor lamps in which a plurality of lamps are mounted on a common pivot rod.

946,040. ELECTROLYTIC CELL; J. L. R. Hayden, Schenectady, N. Y. App. filed Aug. 20, 1909. Contains aluminum electrodes and is used as lightning arrester. A heavy liquid is arranged underneath the electrolyte.

946,045. SYSTEM OF ELECTRICAL DISTRIBUTION; A. S. Hubbard, Belleville, N. J. App. filed Feb. 19, 1906. A storage battery is placed in parallel to the main generator for regulating the load. The operator can adjust by apparatus acting upon the battery circuit, that is the booster, the average generator load without varying the proportion of change of load that falls upon the main generator. The booster is adjusted in opposition to the primary regulating coil.

946,053. MEANS FOR STARTING SERIALLY OPERATED VAPOR CONVERTERS; F. H. Von Keller, New York, N. Y. App. filed March 8, 1907. For starting the lamps by a starting electrode cooperating with the negative electrode with means whereby the starting current causes direct current to flow between the starting electrode and the main electrode of the next lamp.

946,068. MEANS FOR EXHAUSTING INCLOSED RECEIVERS; M. Von Reckling-Hausen, New York, N. Y. App. filed July 30, 1904. For mercury vapor apparatus. A closed container, a holder therewithin, magnesium within the holder and a source of electric current connected with opposite sides of the magnesium for absorbing gases.

946,070. ELECTRIC LAUNDRY IRON; E. H. Richardson, Ontario, Cal. App. filed Feb. 15, 1909. A spring-pressed lever actuates the circuit-closer for the electrical heater and confines fusible material which contains a shaft with a twisted blade engaged by a ratchet which produces a quick break of the circuit.

947,079. ELECTRODE FOR VAPOR ELECTRIC APPARATUS; P. H. Thomas, East Orange, N. J. App. filed Feb. 10, 1904. Leading-in devices are connected with the electrode, the devices consisting of a conducting hardened paste, a portion of which adheres to the walls of the containers and surrounds the devices.

946,080. LIGHTNING ARRESTER; P. H. Thomas, Montclair, N. J. App. filed Sept. 27, 1905. An alternating-current circuit with a spark gap in the ground circuit with a number of vapor devices in the ground circuit with a number of shunts, each containing a condenser, the several shunts connected individually so as to shunt different numbers of vapor devices.

946,105. DYNAMO ELECTRIC MACHINE; J. W. Burleigh, Taunton, England. App. filed Aug. 10, 1908. An improved coil winding. Two field magnet cores have an arched coil with an ogee coil exciting them, the straight parts lying alongside of each other in a neutral zone in parallel with the axis of the armature.

946,135. SUPPORTING DEVICE FOR TROLLEY WIRES OF ELECTRIC RAILWAYS; K. Von Kando, Vado Ligure, Italy. App. filed Oct. 2, 1908. A supporting arm carrying an insulator with rods pivoted on the insulator and an attachment piece pivoted to the rods to which the trolley wire is attached.

946,156. ARC LAMP; W. D'A. Ryan, Lynn, Mass. App. filed Nov. 18, 1903. A twin arc lamp in which the two arcs extend in opposite direction from a fixed electrode to movable electrodes, a magnet controls the arcs and a single dash pot controls the motion for both movable electrodes or of either one separately with regulating means for each arc dependent upon the condition of the other arc.

946,157. SWITCH CONSTRUCTION; W. M. Scott, Philadelphia, Pa. App. filed June 5, 1909. Flush switches mounted in walls in which the plaster is prevented from getting into the receptacle by closing lids held in place by the switch mechanism and entirely closing the switch box.

946,166. SPACE TELEGRAPHY; J. S. Stone, Cambridge, Mass. App. filed Feb. 27, 1906. A power circuit, a sonorous circuit, a radiating system, and a circuit connected across the generator of the power circuit, including a condenser with a metal connection from one armature of the condenser to the frame of the generator. Protects electrical apparatus from excessive currents.

946,167. SPACE TELEGRAPHY; J. S. Stone, Boston, Mass. App. filed Feb. 7, 1907. For developing waves by a plurality of oscillating circuits, each having a condenser and an inductance coil and in parallel with a spark gap, together with an elevated conductor having a plurality of parallel branches, each associated with a different oscillating circuit; also a circuit of large resistance and high unidirectional e.m.f connected to the terminals at the spark gap.

946,168. SPACE TELEGRAPHY; J. S. Stone, Boston, Mass. App. filed March 12, 1908. For increasing the power factor of the primary power circuit. A space telegraph with a sonorous circuit, a discharger therefor, a power circuit and a transformer with primary connected to power circuit and secondary to sonorous circuit, together with means associated with the power circuit for increasing its power factor.

946,192. METHOD FOR OBTAINING METALLIC ATTACHMENTS FOR INCANDESCENT LAMPS; P. Azaria, Paris, Franch. App. filed July 28, 1909. Process of autogenous soldering for connecting metal filaments to lamp holders by passing an intense current through refractory material near the points where the soldering is to be effected and heating them by radiation.

946,193. ELECTROMAGNET; E. Bachelet, New York, N. Y. App. filed Feb. 18, 1907. For therapeutic devices. The magnetic field is intensified on one side and reduced on the other side of the magnet. Uses a coil, a metallic deflecting plate at one end and a removable screen plate of magnetic material at the opposite end.

946,212. DYNAMO ELECTRIC MACHINE; R. Flagg, St. Louis, Mo. App. filed Feb. 1, 1909. Uses a core, a winding projecting beyond the core and a flexible support for the ends of the winding to avoid vibration being transmitted to the winding.

946,215. ELECTROMAGNETIC DEVICE; H. G. Geissinger, New York, N. Y. App. filed April 12, 1909. A lifting magnet with reduction of current after the armature has reached its holding position, the reducing means being responsive to a change of magnetic flux in the core of the magnet dependent upon the position of the armature.

946,220. CIRCUIT BREAKER; E. M. Hewlett, Schenectady, N. Y. App. filed July 29, 1907. Switch which opens automatically on abnormal current with time limit tripping mechanism, the former being controlled by a thermostat.

946,230. KEYBOARD OPERATING MECHANISM; H. Knudsen and H. Barta, London, Eng. App. filed May 3, 1909. Type-setting by wireless telegraphy. A plurality of keyboards, one connected to the other by transmitting and receiving machines, synchronously moving parts in the connections which establish contacts and which include belts, one of which carries a contact chamber and a series of sliding pins, which can be raised into the path of the contact finger.

946,251. ELECTRICAL FUSE BLOCK; A. A. Moffit and G. E. Andrews, Providence, R. I. App. filed July 23, 1909. Plurality of contact clips, a separating member with a perforation of particular shape and size to compel the use of a particular fuse, the member being between the clips.

946,257. AUTOMATICALLY RELEASED ALARM BOX FOR FIRE EXTINGUISHER SYSTEMS; J. G. Nolen, Chicago, Ill. App. filed Feb. 29, 1904. An automatic alarm is given when the pressure in the distributing pipes increases above normal by means of a clockwork, a flexible diaphragm subjected to the pressure of the pipes and held by a spring, the clockwork being released upon a prolonged increase of pressure.

946,258. SIGNALING APPARATUS AND CIRCUITS THEREFOR; J. G. Nolen, Chicago, Ill. App. filed April 25, 1904. A signal box with a normally wound motor controlled by a movable stop which can be locked in mid-position to stop the motor and is actuated electromagnetically.

946,259. COMBINED BURGLAR ALARM AND TELEPHONE SYSTEM; J. G. Nolen, Chicago, Ill. App. filed May 23, 1907. Combined burglar alarm and telephone system, the alarm being responsive to the circuit-closers and consisting of relays or buzzers which produce sounds in the operator's receiver.

946,267. ELECTRICALLY OPERATED HAMMER; L. Paulero, Petersburg, Va. App. filed June 27, 1908. For keeping the parts cool and for regulating the stroke of the hammer. The hammer is operated by a solenoid which actuates an air pump to force air through the hammer and to blow away the dust from the work.

946,270. TELEPHONE ADJUNCT; A. Rector, New York, N. Y. App. filed Dec. 4, 1908. Telephone head piece with ear cups to fit both ears, the cups being connected by a speaking tube.

946,287. LOCKOUT DEVICE FOR TELEPHONE; C. W. Throckmorton, Pittsburgh, Pa. App. filed March 12, 1907. Lockout for telephones for automatically controlling a party line comprising a talking circuit, a ringing circuit, a selective circuit controller at central and a spring at the subscriber's station automatically wound and governed by the circuit controller.

946,309. SWITCH HANDLE; C. E. Anderson, Bridgeport, Conn. App. filed Aug. 17, 1909. Rotary snap switch with a ratchet between the handle and the body of the switch spindle whereby the removal of the handle from the switch spindle is rendered more difficult.

946,364. RESISTANCE DEVICE; G. Hookham, Birmingham, Eng. App. filed March 13, 1909. Elimination of temperature errors from resistance devices. Resistance includes a resistance wire, a mercury column, there being a number of knots in the wire which are amalgamated and the mercury column being movable along the wire.

946,372. KEYBOARD TELEGRAPHIC TRANSMITTER; E. E. Kleinschmidt, New York, N. Y. App. filed Feb. 7, 1905. A series of key bars, a series of selective bars with lugs in arrangements with telegraphic symbols, a series of wires moved by the lugs when a key bar is operated, one lug representing a dot and two dashes.

946,373. GUARD COVERING FOR THE THIRD RAILS OF ELECTRIC RAILWAYS; J. Kress, New Rochelle, N. Y. App. filed Aug. 27, 1908. The movable guard plate can be held away from the fixed guard plate so that the shoe can contact with the rail without shifting the movable plate.

946,380. TELEPHONE METER SYSTEM AND APPARATUS; R. H. Manson, Elyria, Ohio. App. filed April 18, 1907. A line circuit with speech transmitting and receiving instruments, a time registering device and an electric motor energized from said circuit and connected to said time registering device to operate the same only upon the flow of current in a predetermined direction.

946,381. TELEPHONE METER SYSTEM AND APPARATUS; R. H. Manson, Elyria, Ohio. App. filed April 18, 197. Connecting circuit for telephone lines comprising suitable terminals, time period measuring meters associated with the lines, a source of electric energy operatively connected to the circuit and a relay to reverse the connection of the source of the line of the calling subscriber to operate the meter of the calling subscriber.

946,382. TELEPHONE METER SYSTEM AND APPARATUS; R. H. Manson, Elyria, Ohio. App. filed April 18, 1907. A plurality of subscribers' stations are connected by suitable line circuits with the central office and the meter at each of two of said stations comprising a registering mechanism and an electric motor operated from the line circuit is arranged to operate the register with means controlled by the operator at central for supplying current initially in the opposite direction to the line and means for reversing the flow when a through talking connection is completed with a second subscriber.

946,390. SOCKET SPINDLE; L. H. Moulthrop, Bridgeport, Conn. App. filed Oct. 11, 1909. A spindle for key sockets, recessed, with a shell carrying a stem receiving a thumb key and an insulating lining which are depressed into the recess to form a joint with the spindle.

946,395. PULL SOCKET FOR INCANDESCENT LAMPS; H. T. Paiste, Philadelphia, Pa. App. filed March 18, 1908. The switches includes a shaft, a contact thereon, which engages another contact, a supporting structure loosely rotable on the shaft, a pawl pivoted to the structure and a chain connected to the pawl.

946,409. CUT-OUT; J. G. Swallow, Brooklyn, N. Y. App. filed June 6, 1908. A cut-out block having a plug receptacle with independent means for carrying a horizontal fuse above it.

946,410. PORTABLE TELEPHONE TRANSMITTER AND RECEIVER OR TESTING INSTRUMENT; H. F. Thoma, Jr., and C. E. McGrew, Chicago, Ill. App. filed Dec. 14, 1907. For telephone lines. A transmitter casing, a receiver casing, a connecting arm therefor, all of fiber, with wires and metallic screws for the connections within the casing.

946,412. ATTACHMENT PLUG; L. A. G. Widener, New York, N. Y. App. filed Sept. 10, 1909. A plug for incandescent lamps which permits attachment to the socket without twisting the wire connections. The plug carries resilient sockets.

946,413. ELECTRICAL CIRCUIT PROTECTOR; Wiesinger, Adrian, Mich. App. filed Dec. 29, 1903. For protecting telephone lines, etc., from sneak currents, by means of a heat cartridge carrying fusible material released under heat, which device is placed in condition for another operation without changing the cartridge. The cartridge consists of a tubular case carrying contacts in the top and bottom with which the fusible material engages.

946,418. COMBINATION SWITCH AND LIGHTNING ARRESTER; S. W. Wood and E. T. Thoma, Lookeba, Okla. A non-conducting base carrying a lever, spring jacks engaged thereby, additional spring jacks, fuses between the latter and the telephone wires, a bridge connected to the lever, carbon blocks between the telephone wires and the line wires, and the ground wire attached to the carbon block with an auxiliary carbon block between the lever and the ground wire.

946,432. METHOD OF MANUFACTURING CARBID AND PRODUCTS OF SAME; H. L. Hartenstein, Constantine, Mich. App. filed Feb. 18, 1907. Produces a fused body of carbid and mixes therewith hardened particles of carbid.

946,433. MANUFACTURE OF CARBID; H. L. Hartenstein, Constantine, Mich. App. filed Feb. 18, 1907. Calcium carbine in the form of detached separate solidified particles.

946,434. CARBON HOLDER; H. L. Hartenstein, Constantine, Mich. App. filed Nov. 19, 1906. Carbon holders for electric furnaces, including a supporting arm, the carbon being clamped thereto by a plate driven by a wedge.

946,435. CARBON HOLDER; H. L. Hartenstein, Constantine, Mich. App. filed March 11, 1907. Carbon holders for electric furnaces, including a channeled bar and two jars secured thereto which engage the carbon, one jaw being independently movable.

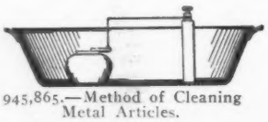
946,473. SYSTEM OF DISTRIBUTION; C. P. Steinmetz, Schenectady, N. Y. App. filed Aug. 13, 1909. A number of generators are connected in parallel to a common set of bus-bars and the flow of current on short circuit is restricted. The bus-bars have sections to which the generators are connected and current-choking connections are arranged between the sections in series with the switches.

946,487. ELECTROMAGNET; E. A. Burlingame, San Francisco, Cal. App. filed July 13, 1908. Operates a part through a selective distance from neutral according to the voltage. The magnet carries two circuits, one being in secondary relation to the other and an armature in two portions, the second portion opening or closing the circuit of the secondary circuit with springs of different strengths between the armature and the magnet.

946,489. ELECTRICAL RELAY OR ELECTROMAGNET; E. E. Clement, Washington, D. C. App. filed Dec. 16, 1905. A magnetic frame carrying a winding with a plunger core and contact springs with levers operated by the core to actuate the spring.

946,497. METHOD OF MANUFACTURING CARBID; H. L. Hartenstein, Constantine, Mich. App. filed Feb. 18, 1907. Molten carbid is disintegrated into a multiplicity of aerially suspended particles which are collected subsequent to sufficient cooling and solidification to enable them to retain their shape without losing their superficial adhesiveness.

946,502. ALTERNATE-CURRENT MOTOR; V. A. Fynn, London, Eng. App. filed July 20, 1905. Alternating motor starting as a repulsion motor with means for shifting the axis of the resultant



945,865.—Method of Cleaning Metal Articles.

945,997.—Centrifugal Switch.

stator field with relation to the repulsion brushes. Makes use of repulsion brushes, and auxiliary brushes displaced 90 electrical degrees. Means for short-circuiting the auxiliary brushes, the stator having two windings and a switch for varying the number of effective turns of one group of windings.

946,503. SINGLE-PHASE COMMUTATOR MOTOR; V. A. Fynn, London, Eng. App. filed Oct. 5, 1906. Single-phase commutator motor starting as a repulsion motor whose starting torque is controlled without the use of transformers. Uses a field winding partly on the rotor and partly on the stator.

946,504. ALTERNATE-CURRENT MOTOR AND GENERATOR; V. A. Fynn, London, Eng. App. filed Dec. 21, 1906. Polyphase commutator motor in which the revolving member carries current conductively impressed along as many axes as there are motor phases, a stationary member with a neutralizing winding for each phase, a field winding for each phase whose axis is displaced from the corresponding neutralizing winding, with means for impressing on the field two e.m.f.'s. differing in phase.

946,505. ALTERNATING-CURRENT MOTOR; V. A. Fynn, London, Eng. App. filed March 6, 1909. Single-phase conduction motor whose power factor is controlled by a neutralizing winding and teaser winding on the stationary member, a revolving member with a commuted winding in series with the neutralizing winding, an exciting circuit on the revolving member and an auxiliary winding on the stationary member.

946,510. MANUFACTURE OF CALCIUM CARBID; H. L. Hartenstein, Constantine, Mich. App. filed May 5, 1906. Several quantities of molten carbid of different degrees of gas-producing power are blended together while in a hot molten state.

946,511. METHOD OF MANUFACTURING CARBID; H. L. Hartenstein, Constantine, Mich. App. filed Feb. 13, 1907. A fusion is made of lime, anthracite coal and artificial carbon.

946,528. APPARATUS FOR TELEPHONE LINES; C. D. Enochs, La Crosse, Wis. App. filed Nov. 12, 1906. Supervisory circuit, containing signal lamp controlled automatically when the receiver at the subscriber's station is hung up or taken down. An impedance coil and lamp are bridged across the line during conversation, the line, including the subscriber's set, being adapted to shunt out the lamp, which is lighted when the subscriber hangs up his receiver.